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Politics this week

Sep 20th 2001
From The Economist print edition

Fighting terror

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See article: Allies in search of a strategy

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See article: The spider in the web

Afghanistan declined to hand over Mr bin Laden, accused by America of orchestrating the terrorist attacks. Thousands fled from Kabul, the capital, for the Pakistani border, fearing an American strike was imminent. Pakistan's president, Pervez Musharraf, said he would support possible American military action against Afghanistan.

See article: Honoured guest

Yasser Arafat, the Palestinian leader, ordered a ceasefire and Israel's prime minister, Ariel Sharon, gave the order to stop offensive military operations against Palestinians after intense pressure from America. Mr Bush wants relative peace in the **Middle East** to ease America's efforts to build a coalition against terrorism.

See article: Stop, says the superpower

Canada seemed ready to offer military backing to the United States to fight terrorism. Jean Chrétien, the prime minister, said Canada would “go every step of the way” with its neighbour. Earlier, 100,000 people gathered in Ottawa for a memorial service for the victims of the attacks.

See article: Setting a new perimeter

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See article: Waiting and praying

Caucasus strife

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John Hume, a past winner of the Nobel peace prize who has led **Northern Ireland's** mainly-Catholic Social Democratic and Labour Party since 1979, said he would step down as leader in November.

See article: The America effect

Macedonia's government formally asked NATO to provide a force to protect international civilian monitors, once the alliance's mission to collect rebel weapons ends on September 26th.

Switzerland's upper house of parliament voted for its country to join the United Nations, but even those in favour said it would not forgo its neutrality in world affairs.

After a request by Carla Del Ponte, the chief prosecutor at the UN's war-crimes tribunal in The Hague, Greece's ministry of justice said it had started to look into more than 250 bank accounts in Athens linked to **Slobodan Milosevic**, Serbia's former strongman now awaiting trial.

Closer to asylum?

An Australian naval ship carrying **asylum-seekers** arrived in the Pacific island of Nauru, where their applications to live in Australia will be considered. Australia is trying to deter refugees from landing on its shores and has paid $10m to Nauru to act as a staging post. Nine Sri Lankans were jailed for up to five years in Western Australia for smuggling refugees.

At a meeting in Seoul of senior officials of **North and South Korea**, the first for six months, the North asked the South to provide it with electricity. The countries agreed to resume reunions of separated families.

See article: Support of a sort

Four more people died in political clashes in **Bangladesh** in the approach to the general election on October 1st, bringing the death toll to 85 since the campaign started.

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China, South Korea and Malaysia were among the countries that banned the import of beef from Japan after a suspected case of **mad-cow disease** had been reported on a farm near Tokyo.

South Africa's big killer

A report by South Africa's Medical Research Council said AIDS was now the single biggest killer in the country, contradicting recent suggestions by **President Thabo Mbeki** that accidents and violence killed more people. Last year 25% of all deaths, and 40% of those among adults, were AIDS-related. The report said that, without effective treatment, 4m-7m people would die of the disease by 2010, halting population growth.

Six leading members of the government of **Eritrea** were arrested after criticising President Issaias Afwerki. At the same time the private press was banned.

The central bank of **Zimbabwe** said the country's economy was in a downward spiral and would shrink by about 8% this year.

Argentina, which is struggling to banish fears of a debt default, unveiled a draft budget for next year which involves $6.5 billion in spending cuts.

See article: Zeroing in

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The next steps

The battle ahead

Sep 20th 2001
From The Economist print edition

To fight will be hard. But not to fight would be worse

IT WILL be long. It will cause anguish and arguments, both with allies and with others. It will involve more casualties, both military and civilian. It is as hard to define the exact objective as it will be to tell whether or when that objective has been achieved. It will be fraught with risks, both directly for the forces involved and indirectly for many of the governments and relationships that will be affected. Yet the battle that President George Bush and his advisers are now planning and preparing is nevertheless a battle that cannot be avoided. It must be fought, and won.

Many are afraid of the battle that lies ahead. Some are horribly, even obscenely wrong in their reasons for objecting to it, notably those who blame America itself for the horrors that were inflicted upon it last week in New York and Washington, DC (see article). But others are understandably afraid, and are opposed to it for nobler-sounding reasons. They think retaliation would be to stoop as low as the terrorists. They think it would be wrong for more ordinary people to die, in Afghanistan or in a new cycle of violence elsewhere. They argue that it would be better to do nothing beyond self-protection, because that would deprive the terrorists of the satisfaction of having provoked a reaction, especially a reaction whose chances of success look daunting. They want peace, not war.

The sad truth of human relations, however, is that you cannot get peace without fighting for it. Doing nothing would invite far worse consequences than doing something, perilous though that is. It would simply be to delay action rather than to avert it. It would encourage other tyrants and trouble-makers to believe that they can mount such attacks with impunity, in any country in the world, for if America cannot or will not hit back, then perhaps nobody can. Such attacks could well use even more fearsome means, including biological, chemical and nuclear weapons. It would be likely, indeed, that the same network of terrorists that planned last week's attacks would soon mount others, killing yet more innocent people and sowing even more fear. For one observation by the pacifists is surely true: that the terrorists do want to provoke a reaction, and will carry on their attacks until they get one.

It is almost always wrong to dismiss terrorism as “irrational”. The word may seem appropriate when the perpetrators commit suicide in order to carry out their attacks, but it is misleading: terrorism is a horribly calculated attempt to use violence to help achieve an objective. Revenge against America over perceived grievances and acts in the past may doubtless play a part. But there is likely to be more, much more, to this act than that. The aim is plainly destabilisation, both of America itself and of the broad status quo in the world. More particularly, the aim is likely to be the destabilisation of the Middle East and Central Asia, to alter or even remove the presence there of both America and Israel, and to change or destroy the regimes governing the countries of that turbulent region.

That is where the perils will be greatest. The action that must be taken will itself risk bringing about the very destabilisation that the terrorists desire. When attempting to defeat one enemy it is all too easy to create others. Many of the regimes of the Middle East face opposition on their own streets from their own discontented people and from violent groups who will be quick to exploit it if the government is seen to back an American response that goes wrong or is considered to have been misdirected. That worry applies above all to Saudi Arabia, the richest Arab nation, home to Mecca and Medina, and base for American soldiers. Osama bin Laden, if he is the string-puller behind the attacks, would dearly love to see the Saudi regime overthrown and the bases ejected.

Focus, with friends

Even a perilous battle must still be fought. But how? There is also the peril of failure, of revealing your own impotence, when trying to seek out and capture or destroy an elusive terrorist network some of which may be hiding in the caves and mountains of Afghanistan, and some of which may be lurking in the cities and suburbs of your own country. That, after all, was the result in 1998 when the bloody bombings of two American embassies in Africa gave rise simply to an American bombardment which had no discernible effect.

The first requirement is determination. Part of the terrorist's calculation is probably that the will to fight is weak in a modern democracy; that Americans' support for military action will buckle at the sight of the first body bags, and that European allies could show even less stomach for the task. Almost certainly, that is also the terrorists' biggest mistake. In a war launched directly on Americans, on American soil, the will to fight back is going to be great and long-lasting. The patriotic mood in America last week was not bellicose, as many European leftists have claimed: it was sombre, deep-seated and determined. There is certainly a risk that some European countries may not share that determination once the fighting nears; some have already begun to shrink back from it. But to fail to support, and in some cases fight alongside, America would be folly, grand scale: it would not only encourage further terror, but would also shatter American willingness to do anything to help defend Europe in the future.

The second requirement is a sense of priorities. President Bush and others have been right to say that the enemy is not just the terrorists themselves but also those countries that harbour and foster them. But the more ambitious the effort, the less likely it is to succeed. No commander likes to fight on several fronts at once. President Bush will need to choose what his top priority should be—probably Osama bin Laden and his network (see article)—and focus first on that, rather than embarking immediately upon a wider war.

The third requirement is patience. This is not a task that can be completed quickly, nor is it one in which military means alone will suffice. America needs not only military allies among its usual friends in NATO, but also support from the Islamic states that surround Afghanistan and other hosts of terrorism, and from all countries through which the terrorists organise their finances and their logistics. Ideally, America would first cut off the network's nourishment, then isolate it and its leaders, and then move in to defeat it. Diplomacy, to elicit or induce co-operation from many countries, is therefore going to be vital (see “Fighting terrorism” and “The military options”).

That is most vital of all for the fourth requirement: intelligence. In this difficult, tortuous task, the word counts in both of its senses. With regional allies, it is the second sense, of espionage and information, that matters most. To reach those terrorists who are hiding in Afghanistan or elsewhere, American forces will need both to learn where they are and to be able to get there quickly. They therefore need help from other countries' intelligence services, as well as co-operation to be able to base their forces near to the terrorists' hiding places.

Although military action may begin with aerial bombardment of some sort, the real job is likely to be done by highly mobile special forces, mounting attacks from a number of different bases. It will not be a big, set-piece battle like the Gulf war. Nor will it be a battle in which there is one clear opponent to be fought and vanquished: defeats will have to be meted out, on terrorist bands and, quite probably, on their Taliban hosts. Such victories will be necessary, both to deter enemies and to encourage supporters, but they will not add up to an ultimate victory, for terrorist networks are too fragmented and insidious for that. What the deaths of more than 5,000 people showed, on September 11th, was that we will always be vulnerable to extremists' acts, however sophisticated our technology or our society. The price of liberty, as Thomas Jefferson pointed out two centuries ago, is eternal vigilance.

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The causes

The roots of hatred

Sep 20th 2001
From The Economist print edition

Whatever its mistakes, the idea that America brought the onslaught upon itself is absurd

AP

WHO is to blame? The simple answer—the suicide attackers, and those behind them—is hardly adequate, just as it would hardly be adequate simply to blame Hitler and his henchmen for the second world war, without mentioning the Treaty of Versailles or Weimar inflation. But that does not exculpate the perpetrators of last week's onslaught, just as the Versailles treaty does not excuse Auschwitz: whatever their grievances, nothing could excuse an attack of such ferocity and size. So what explains it? A surprising number of people, and not just gullible fanatics looking for someone to hold responsible for the hopelessness of their lives, believe that to a greater or lesser extent America has reaped as it sowed.

If this charge is to be taken at all seriously, it must first be separated from the general anti-Americanism fashionable in some left-wing circles in Europe, say, or even Latin America. It may be reasonable to dislike the death penalty, a society so ready to tolerate guns, even the vigour of a culture that finds its expression in unpretentious movies and McDonald's hamburgers, but none of these could conceivably explain, let alone justify, a single act of terrorism. Similarly, though globalisation clearly arouses fury among protesters, and concern among some more moderate critics, it would be ridiculous to think that last week's attack was prompted by any American antipathy towards welfare payments, closed economies or restraints on speculative capital movements.

The charge that in politics the United States is arrogant, even hypocritical, may deserve more notice. America has recently brushed aside some good international agreements (on nuclear testing, for example, a world criminal court, land mines), as well as dismissing some bad ones (the Kyoto convention on global warming) with an insouciance unbecoming to the world's biggest producer of greenhouse gases. Its understandable determination to pursue a missile shield threatens to upend the system of deterrence and arms control that has so far saved the world from nuclear Armageddon. It has refused to pay its dues to the United Nations, even as it has cut its aid for the world's poorest. Its eagerness to prosecute African and Balkan war criminals while refusing to allow its own nationals to submit to an international court has made it seem unwilling to hold itself to the standards it imposes on others.

Were these actions unwise? Possibly. Have they caused resentment? Yes. But could that resentment plausibly have motivated a single one of last week's suicide attackers? No.

The seeds of discord

Perhaps it would be more profitable to look deeper into the past. During the half-century of the cold war, the United States undoubtedly subordinated principles as well as causes to the overriding concern of defeating communism. The great upholder of laws at home was happy to trash them abroad, whether invading Grenada or mining Nicaraguan harbours. It propped up *caudillos* in Latin America, backed tyrants in Africa and Asia, promoted coups in the Middle East. More recently, it has been willing to kick invaders out of Kuwait, to strike at ruthless states like Libya and Iraq and, moreover, to go on trying to contain them with sanctions and, in Iraq's case, with almost incessant bombardment. Is it here perhaps—especially in the Middle East—that America has gone wrong?

No. *The Economist* has not been an uncritical supporter of American policy in the Middle East. We have

been more ready to argue the Palestinian case than have recent administrations and believe that the United States could sometimes have done more to restrain Israel. We have also pointed out that the policy of sanctions against Iraq, whatever its intention, in practice punishes innocent Iraqis and thus allows Saddam Hussein to blame the West, notably America, for the deaths of thousands of Iraqi children. Perhaps nothing does more to fuel anti-American resentment in the Arab world. Such criticisms as we have made, however, in no way imply that we think America was wrong to fight the Gulf war or to try to disarm Saddam afterwards. It was also right to stand by Saudi Arabia as an ally, however much that annoyed zealots. Similarly, whatever Israel's mistakes, America can hardly be accused of having failed to try to bring it to a peace: every administration of recent years has attempted to bring the two sides together, and none has come closer than Bill Clinton's last year.

America defends its interests, sometimes skilfully, sometimes clumsily, just as other countries do. Since power, like nature, abhors a vacuum, it steps into places where disorder reigns. On the whole, it should do so more, not less, often. Of all the great powers in history, it is probably the least territorial, the most idealistic. Muslims in particular should note that the armed interventions in Bosnia and Kosovo, both led by America, were attacks on Christian regimes in support of Muslim victims. In neither did the United States stand to make any material gain; in neither were its vital interests, conventionally defined, at stake. Those who criticise America's leadership of the world's capitalist system—a far from perfect affair—should remember that it has brought more wealth and better living standards to more people than any other in history. And those who regret America's triumph in the cold war should stop to think how the world would look if the Soviet Union had won. America's policies may have earned it enemies. But in truth, it is difficult to find plausible explanations for the virulence of last week's attacks, except in the envy, hatred and moral confusion of those who plotted and perpetrated them.

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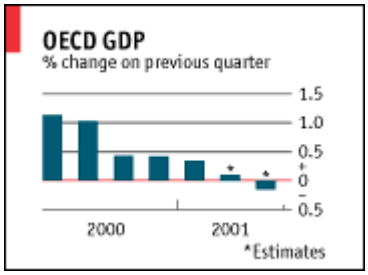
The economic aftermath

More pain ahead

Sep 20th 2001
From The Economist print edition

Despite this week's interest-rate cuts, the economic outlook remains murky



IN THE immediate wake of the assault on America, it seemed positively callous to think about its economic impact. But as America celebrated the triumphantly smooth reopening of its stockmarkets this week, bad economic news could no longer be ignored. The world's central banks, led by the Federal Reserve, tried a pre-emptive move by making the first co-ordinated series of interest-rate cuts since the 1987 stockmarket crash. But the markets were right not to be much impressed, and to mark prices down sharply (see article).

This is not because the attacks will themselves have such dire economic effects. The trouble is that they came at such a fragile moment for the American and world economies. The University of Michigan survey, taken before the attacks but published afterwards, showed American consumer confidence at its lowest level for eight years. And that was just one of a raft of recent indicators suggesting that the American economy was heading into recession even before September 11th. Now consumer confidence is likely to slip further. And the news beyond America is also bad. Indeed, since the world's economies are unusually synchronised at present, the sharp slowdown in America means that the global economy is on the verge of its first recession since 1990.

To the rescue?

What should governments and central banks do? This week's interest-rate cuts were sensible and even, in the case of Europe, overdue. So was the belated conversion to monetary relaxation by the Bank of Japan, though it needs to do more still. Over the next few weeks, more monetary easing is likely to be needed. Yet, although the full impact of the Fed's interest-rate cuts so far this year has still not been felt, looser monetary policy alone is unlikely to be enough to fend off recession. Unlike previous recessions since the second world war, which were mostly demand-led, this one reflects a credit and investment bust that will take longer to work through the system.

If monetary easing by central banks will not be enough, that puts more of a burden on governments. Fiscal policy, in particular, should be used to cushion the impact of recession. Fortunately, in both Europe and America, inflationary pressures are extremely low and public finances are healthy. Now is not the time to heed hair-shirt philosophies that might artificially constrain fiscal policy, such as Europe's “stability pact” or America's Social Security “lock-box”. With the risks to the world economy so clearly on the downside, it would be better for most governments to err on the side of too much fiscal stimulus than too little. The gloomy outlook also makes it even more important that governments should nourish the free trade that has been at the heart of post-war growth: the need for a new trade round to be launched in Doha in November is more pressing than ever.

The other big issue for governments to think through is whether, and how far, they should come to the rescue of industries and businesses that are suffering in the aftermath of the terrorist attacks. This is most acute for the airlines, for which the American government is preparing a large aid package (see article). But other businesses, from hotels to aerospace to insurance, may be next in line to seek help.

In a few specific cases, notably the airlines, there is a case for temporary, well-directed public subsidy. America cannot afford to let several of its big airlines go under simultaneously, for the effect on jobs and confidence could be too great. The government should compensate the carriers for the time when they were grounded, and it should also take on the burden of paying for tighter security at airports. But there

is a danger in too much indiscriminate support: it would freeze the airlines in their present form, with their current capacity, and reduce competition, at a time when the right response is probably to shrink the industry. It would be better to allow most airlines to go into chapter 11 bankruptcy than to use subsidies to keep some of them out of it. If the number and size of airlines in America and Europe needs to be cut, governments should not prevent that from happening.

A similar message holds elsewhere. Ahead of the reopening of the stockmarkets, for instance, regulators relaxed several rules on such things as share buybacks, in the hope of propping up share prices. But stockmarkets need to fall, not just to reflect the prospect of recession but also to correct their previous overvaluation. More generally, the American and world economies are suffering from overcapacity. Although governments should soften the pain of recession so far as they can by expanding demand, market forces are the best way to eliminate excesses in supply. They are also the best response to an attack that was, in one sense, aimed at the free-market system itself.

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Letters

Sep 20th 2001
From The Economist print edition

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Responding to terror

SIR – These terrorist attacks are an assault on American principles and values. But the Statue of Liberty, a symbol of American freedom, was not the target. What the terrorists hate—and what the World Trade Centre stood for—is an exalted, boastful pride in a prosperous, successful life. The twin towers were a courageous statement of pride in America's unsurpassed material prosperity. New York city is home to some of America's greatest businessmen. In honour of the prosperity which is their achievement, the twin towers must indeed be rebuilt—but higher.

Blake Scholl
Kirkland, Washington

SIR – The world has now woken up to the reality of the massive destruction that a small group of determined and resourceful fanatics can cause. The chance of a worse attack anywhere in the world, perhaps with biological or nuclear weapons, is no longer the stuff of Hollywood. Despite the rhetoric, there is little the American military can do in its “war” on terrorism other than to capture those linked to the attacks. Indiscriminate bombing of countries that harbour suspected terrorists will simply breed more extremists seeking revenge.

The focus should be on upgrading intelligence-gathering capabilities and tightening domestic security. America would also be well-advised to take steps to minimise the perception among many in the world that it is an aggressor state. The cause of the attack was not jealousy of American power and wealth but a deep resentment of what is perceived as American bullying and arrogance in international affairs. A less trigger-happy and hegemonistic America would go a long way to reducing the terrorist threat.

George Tintor
Zurich

SIR – The financial community must come together and fight terrorism on a financial basis. A vital factor for any terrorist—or drug lord for that matter—is money. Without it no terrorist could carry out a reign of terror. If this is truly a war on terrorism, it must be fought on all fronts. All governments that wish to fight terrorism must work together and repeal the laws of secrecy on financial dealings. I am sure the political elite of countries such as the Cayman Islands, Liechtenstein and Switzerland understand the need to remove the financial stability of terrorists.

D. Gregoris
Toronto

SIR – The United States will continue to lead the world in encouraging economic and political freedom. However, this cannot be done at the barrel of a gun. America's military alliances and her forceful interference in the affairs of other nations have made it a target for terrorism. It is time for America to keep its military strength at home.

Michael Hall
Decatur, Georgia

SIR – Continuous media coverage of the attack on the World Trade Centre and its aftermath has brought

a large proportion of people in the developed world both to a state of acute empathy with those who have lost loved ones and to the belief that September 11th was unique. Vile, unspeakable, grotesque, terrifying—we struggle and fail to find words to give due weight to what happened. And warranting a response? Of course. However, other recent mass killings—whether accidental as in Bhopal, natural disasters as in Guatemala or India, or planned as in Chechnya, Rwanda, Tibet, Sudan or Iraq—did not receive such sustained media attention and did not happen in the developed world.

The destruction of the World Trade Centre was a terrible, depraved, large-scale mirror image of what is already the experience of many outside the developed world: people, going about their normal business, being obliterated out of the blue by the planned, hostile actions of others. The duty of "civilised people" at this time is not to eulogise America as a bastion of freedom but to do all in our power to engender restraint, to ensure that America's response is just, measured, effective and not counterproductive, and that it does not mete out death and destruction to those who bear no responsibility for September 11th.

Seb Schmoller
Sheffield

SIR – There has not been enough consideration of the difficulties of finding and punishing the terrorists responsible for the attack on America, particularly if Osama bin Laden has structured his organisation, al-Qaeda, with an effective succession plan. Such shadowy organisations operated by zealots are not new. The ancient Hebrew Sicarii and medieval Syrian Assassins were terrorists of their times, and even the Christian Knights Templar operated with little check on their actions and were considered by their enemies (and even some friends) to be terrorists. In those times, the enemies of the terrorists fought for decades and centuries to defeat them, because even if you killed the leader someone just as effective would take his place.

Morgan Rodwell
Calgary

SIR – A photograph accompanying your article on the Middle East reaction to the events in America ("Mixed emotions", September 15th) highlights one of the ironies in today's world: the Palestinian boy holding an AK-47 rifle in celebration of the attack on America is wearing what appears to be a Chicago Bears jersey.

Slightly over 20 years ago the United States boycotted the Olympic Games in Moscow ostensibly to protest at the then Soviet Union's invasion of Afghanistan. At the same time, America was providing funds for the Mujahideen groups in the country that begat both Osama bin Laden and the Taliban.

Diego Hoic
Highland Park, New Jersey

SIR – Two arguments in your leader are naive ("The day the world changed", September 15th). First, that it was a political mistake to move the president around the country during the attack. From a military point of view, it would be beyond absurdity to move him into the place being attacked by unknown enemies. Americans would have no use for a dead president who went down in flames just to look good for the cameras.

Second, that the planned missile-defence initiative is wrong because terrorists do not fire missiles, they fly planes. These zealots flew planes into our buildings because, at present, they could not inflict the same amount of damage from afar. Man stopped fighting with swords when rifles were invented, and you can rest assured that he will equally stop flying planes into buildings when he can fire a vehicle-launched cruise missile into Europe or America from a dirt road in the third world. When this time comes in 30 years or so, your children and grandchildren will be grateful that people like George Bush were in charge now.

Eric Segarra
Virginia

SIR – Terrorism is the weapon of the powerless. Sudden attacks on unsuspecting victims are its means of attack. Please do not call these atrocities an "act of war". It will be as much of a war as the war on drugs and the war on crime. We can fight to eradicate terrorism, but never will this lead to victory.

Mark Zellenrath

Rotterdam

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Fighting terrorism

Allies in search of a strategy

Sep 20th 2001 | LONDON AND WASHINGTON, DC
From The Economist print edition

AP

First, build the coalition. Then, think what to do

TWO days after the destruction of the World Trade Centre in New York and the simultaneous assault on America's military nerve centre, the Pentagon, President George Bush declared the United States to be "at war" with international terrorism. He enjoined America's soldiers, and with them the American people, to "get ready" for military conflict and for further sacrifice. At the memorial service in Washington's National Cathedral for the close to 6,000 victims of the bloodiest terrorist assault in history, the leader of the world's most powerful country declared that this conflict, "begun on the timing and terms of others...will end in a way, and at an hour, of our choosing."

Mr Bush picked his words to send a message of resolve not just to America but to the world. But what does it mean to be at war with terrorism? Who are the enemy? What are the right tools, and what is the best strategy, to fight them with? If this is indeed to be the first war of the 21st century, is victory possible against an enemy that demands neither territory nor any other recognisable war booty, and seeks only the maximum possible destruction with no calculation of restraint? And what might such a victory look like?

Mr Bush's immediate target is clear. This week he called on the Taliban, the rulers of Afghanistan, to hand over Osama bin Laden, the fugitive terrorist leader they have long sheltered—or else. He wanted Mr bin Laden, he said, "dead or alive". Other western intelligence agencies concur with the initial judgment of America's: that all the evidence gathered so far points to Mr bin Laden as the prime suspect.

Mr Bush is unlikely to wait long before striking back

But even getting at him, let alone the loosely-knit and widely-dispersed terrorist network over which he presides, will not be easy (see article). Earlier this week, a high-level Pakistani delegation, given special United Nations dispensation to break the international embargo and travel to Afghanistan to try to talk the Taliban into handing him over, left Kabul empty-handed. Amid calls for Afghanistan to renew its *jihad* ("struggle" or "holy war") against America, the country's highest-ranking Islamic clerics, summoned by their leader, Mullah Muhammad Omar, to respond to the mounting pressure from the outside world, said that Mr bin Laden should leave voluntarily. Mr Bush is unlikely to wait long before striking back at the man and the organisation he suspects of causing the greatest number of casualties on American territory in a single day since the civil war, and at the country that harbours him. On September 20th, 100 extra American war planes were moved to the Gulf in preparation for action.

In that strict sense, America is not only sounding, but acting, as if it is going to war. Reserves are being called up. Congress has passed a resolution giving the president power to "use all necessary and appropriate force" against any individual, organisation or country that played any role in last week's

attacks, and allowing for pre-emptive strikes to prevent any more. It has already appropriated $20 billion for that purpose, on top of the $20 billion assigned for rescue and clean-up operations at home. Public opinion is overwhelmingly in favour of military action against terrorists, though more nervous of using force against states that sponsor them.

International opinion is a little more varied. Even those countries that back America to the hilt are calling for coolness and deliberation before military action is taken. Others, such as Russia and China, want nothing to be done without the approval of the UN Security Council.

AP

It could be London, Paris, Canberra...

But NATO responded last week by invoking, for the first time in its 52-year history, Article 5 of its founding treaty, which declares the attack on America to be an attack on the alliance as a whole, and enables America to call on its allies for military support. And few would argue that America does not have the legal right, under Article 51 of the UN charter, to strike back at its tormentors. The United States is naturally reserving the right to take unilateral action; but talks are under way with many countries, from America's close allies in Europe to Islamic Pakistan and some of the countries of Central Asia and even farther-flung Australia, to gather the military support, access to bases and over-flight rights that America may need.

Retaliation may indeed be justified and necessary—if only to persuade the world, and especially other would-be terrorist groups, of the strength of America's determination to fight back after such devastating attacks on its territory, its values and its institutions. But the struggle America is preparing to wage will be long, complex and dangerous. President Bush has made it clear that this is not just a war against the terrorists responsible for last week's atrocities, but against terrorism itself.

Needed: allies inside Islam

That is why this will be unlike any other war America has fought. Mr Bush has called it a “crusade”, a word with just the bruising overtones that some Islamic extremists have used in the past to justify their murderous assault on America and all it represents. Yet the president has no intention of declaring war on the Islamic world. On the contrary, he is now hoping for direct help from a number of its governments, from the Middle East to Asia, in isolating and eventually eliminating groups, such as Mr bin Laden's, that use Islam as a cover for their crimes. However, both he and his senior officials have given warning that America will go after not only terrorist groups but also the governments that sponsor or support them.

Apart from Afghanistan itself, America's list of “the usual suspects” in the terrorism business has long included Iran, Iraq, Libya, Syria, North Korea, Sudan and Cuba. Since last week's attacks, the deputy secretary of defence, Paul Wolfowitz, has talked of “ending” states which sponsor terrorism. If it refused to hand over Mr bin Laden and his associates, Afghanistan's regime would be one obvious target.

Might Iraq be another? In the past there have been reported links between Iraq and Mr bin Laden. So far, there is no clear evidence of Iraqi involvement in last week's carnage. If more were to emerge, America would have little compunction about attacking a regime that is thought to be rebuilding its illegal chemical, biological and possibly nuclear weapons.

Yet most of the states on America's list—Iraq stands out as the exception—have condemned last week's attacks. For the first time in more than 20 years, worshippers in Iran failed to chant “Death to America!” at the start of their Friday prayers. Words of condolence come naturally in the aftermath of ferocious acts of terrorism. Yet this could be a chance for America to find common ground with old foes such as Iran to end some of their official and unofficial support for groups with terrorist connections—a first victory, perhaps, for America's will to prosecute this new war.

For the first time in over 20 years, worshippers in Iran failed to chant “Death to America!” at the start of Friday prayers

Will Mr Bush's chosen tools be diplomacy or force? He will need both. Military pressure—and possible military strikes—on Afghanistan would not just assuage Americans' demands for retaliation, but might help to deter some governments from further aid to Mr bin

Laden's group or others bent on terrorism. Yet his senior aides admit that military strikes—even a whole series of them—cannot win a war with an aim as all-embracing as this one. Indeed, unless America is prepared to alienate wide swathes of the moderate Muslim world, by launching military attacks against any country suspected of having terrorists somewhere on its territory, the direct military options available to America may soon come to seem rather limited.

Pinprick missile attacks against terrorist training camps in Afghanistan and a suspected chemical-weapons plant in Sudan, launched by President Bill Clinton in 1998 after attacks on the American embassies in Kenya and Tanzania, did nothing to deter Mr bin Laden and his followers. Neither have Russia's scorched-earth tactics against rebels (Russia calls them terrorists) in Chechnya, which have reduced that country to rubble. And would the targets be the 1,000 or so operatives thought to be in Mr bin Laden's al-Qaeda network worldwide, or the wider universe of terror organisations, including Islamic Jihad and Hamas in Palestine? If simply killing terrorists were enough, Israel would by now be the safest country on earth.

EPA

Britain and Russia both failed to beat them

Amid all the talk of war, it has been left to Colin Powell, the secretary of state, to spell out the beginnings of a broader strategy. He has called for “a campaign that goes after not just retaliatory satisfaction, but goes after eliminating this threat by ripping it up, by going after its finances, by going after its infrastructure, by making sure we're applying all the intelligence assets we can to finding what they are up to.” And the measure of its success? “No more attacks like this against the United States and our interests around the world.”

In this campaign, as in the narrower military one that is about to be unleashed, America will need allies. But to qualify as a friend of America's, revulsion and words of moral support will not be enough. Mr Powell has talked of a “new benchmark”: how governments now respond to America's requests for help in the war against terrorism “will be a means by which we measure our relationship with them in the future.”

Cold war parallels

In many ways, the nearest parallel to America's new thinking is the determination to contain communism that marked the cold war. This was an equally all-embracing struggle that had military, diplomatic, economic and ideological elements. Of course, the cold war was also a classic military stand-off which ended when the Soviet block finally threw off communism. Islam, by contrast, is here to stay, and many of its adherents are as shocked as the rest of the world at the barbarity of the crimes just committed in its name. Still, as a way of viewing the outside world, the fight against terrorism may now come to represent for America what the cold war did for much of the second half of the 20th century: a means of ordering defence priorities and national budgets at home; a way of organising military, political and diplomatic power abroad; a new focus for old institutions and an organising concept for new ones. Above all, a way of telling friend from foe.

Some have understood this more clearly than others. America has been particularly pleased with the support it has received from Pakistan. That country's leader, General Pervez Musharraf, was quick to offer America assistance, both in pressing the Taliban to give up Mr bin Laden and in offering America use of its air space and other support. Pakistan, through its links with Afghanistan, will have a major role if military efforts are made to dislodge the Taliban from power.

By helping America, Pakistan is taking a risk (see article). Its own Islamic militants have close connections to Afghanistan's mullahs, and American military action could cause a backlash inside Pakistan. But Mr Musharraf understood that this was the moment he had to choose sides, and has made sterling efforts to induce his people to accept that.

If Pakistan is ever to get out from under its mountain of debt and achieve a degree of political stability, it needs the economic support of the West. Japan has already suggested it may resume some of the aid to Pakistan that was cut off after the Indian and Pakistani nuclear tests in 1998. America may do the same. And at a time when Pakistan's great rival, India, has been seeking a new connection with America, Mr Musharraf has a much-needed opportunity to strengthen his own American links. Help with the war

against terrorism could earn Pakistan some American sympathy in its argument with India over Kashmir. At the least, Pakistan's response to the events of the past week may have corrected what Pakistan saw as a dangerous western tilt towards India. But Pakistan, like other countries, can expect to come under pressure to clamp down on its own extremists.

Other countries will face hard decisions, too. Israel and the Palestinians have been pressed to accept a ceasefire and open talks that could dampen down their months of fighting; America wants nothing to get in the way of its efforts to rally Arab support to the anti-terrorist cause. Saudi Arabia has long supported America's presence in the Gulf, while trying to protect its own regime by funnelling money to fundamentalist groups, including some in Pakistan. This has indirectly helped to finance outfits like Mr bin Laden's. Pressure to end this practice could put Saudi Arabia's stability at risk. But difficult calculations will have to be made by many governments—including America's.

Puzzlingly, for an administration that came to office vowing to nurture old friendships and alliances, Mr Bush's team had seemed to spend its first months doing the opposite. Its decision to abandon the Kyoto protocol on global warming irritated many of its friends. So did its readiness to set aside the Anti-Ballistic Missile (ABM) treaty, and its reluctance to accept the constraints of multilateral arms-control agreements. America, it seemed, was prepared to operate on its own: happy if others wanted to tag along, unconcerned if they did not. Will this now change?

Holding on to friends

The Bush administration is already making better use of the international tools that are available. Although America will not submit its military plans to the UN Security Council for approval, it has moved quickly to speed payment of its long-standing financial arrears to the organisation, giving its new ambassador, John Negroponte, a cleaner diplomatic slate for gathering support in the fight against terrorism. The strong condemnation of the terrorist attacks by both the Security Council and the General Assembly has been appreciated. Among the UN conventions already on the books or under debate are a number designed specifically to combat terrorism. These include one, adopted in 1999, to help end the financing of terrorist organisations. America is likely to press more countries to put their names to this.

If nothing else, the assaults on the World Trade Centre and the Pentagon have demonstrated to Americans that they cannot simply look to their own defences and forget the world outside. An international terrorist onslaught needs an international response. Can America pull together such a coalition, and sustain it? Over the next few weeks there will be more at stake than Afghanistan and Mr bin Laden.

Right now, America seems to have more staunch friends and sympathisers than Mr Bush knows what to do with. France's president, Jacques Chirac, and Britain's prime minister, Tony Blair, were both in Washington to confer with Mr Bush this week. These are allies who not only posess the most deployable military forces in Europe, should America need them, but also have influence in parts of the world, from Europe to the Middle East and Asia, that will be equally useful if America's diplomats are to turn the coalition of sympathisers into something more useful and enduring.

Yet there is still worry about the possibility of America going it alone. Despite the strong political and emotional support provided by the allies over the past week, a number of European politicians have said that this does not amount to a “blank cheque” for anything America may now wish to do. Both Mr Chirac and Mr Blair will have wanted to impress on Mr Bush this week the need for a measured and proportionate response, and for a readiness to listen to the concerns of allies. The wider and less discriminating America's military attacks are, should they come, the harder it will be to keep some of America's European allies on board. Yet, if cracks were to appear in the support for America from its NATO allies, the effects could be disastrous—for both. The worry in Europe is that this danger may be less obvious to the administration in Washington than it is to onlookers in London, Paris or Berlin.

Assuming that these dangers can be avoided, how might the change in America's thinking affect the balance of its relations with the other two big powers, Russia and China? Both have long shared America's concern with the fundamentalist threat emanating from Afghanistan, and have condemned last week's attacks. Yet both have their differences with America. Will this be taken as a time to narrow these, or exploit them?

Russia's reaction has been ambivalent. Its defence minister, Sergei Ivanov, was quick to refuse America access to military bases in Central Asia on the borders with Afghanistan—too quick, given that these

bases are in supposedly sovereign countries. Uzbekistan has since sounded more ready to accommodate any American requests for help; Tajikistan, more closely under Russia's thumb, has said little.

Yet Russia's diplomats can also see some opportunities for their country in co-operating with America. Russia has long bristled at western criticism of its brutal war in Chechnya, and is clearly hoping that this will now subside if it makes common diplomatic cause with America against Islamic terrorism. It remains to be seen whether Russia will also now temper its support in the Security Council for lifting sanctions on Iraq.

Vladimir Putin, Russia's president, had already agreed to talk to America about new understandings that might amend the ABM treaty and allow America room to explore anti-missile defences. Although such defences could not have stopped the recent terrorist attacks, America is unlikely to abandon its quest for them. Indeed, its concern about future threats from unpredictably violent countries and people who are attempting to acquire long-range missiles is naturally going to intensify. So too will pressure on Russia to tighten the loopholes in its export controls that have repeatedly allowed missile and related technologies to slip through the net.

So far, Russia has been part of the problem. Can it now become part of the solution? Mr Putin may yet be hoping that, in return for Russia's co-operation in the war against terrorism and a readiness to strike a new strategic bargain over nuclear weapons and missile defences, America will heed Russian concerns by delaying or abandoning any plans to bring the Baltic states into an enlarged NATO.

The Chinese reaction has been even more ambivalent. As expected, China has called formally for America to act only with the approval of the UN Security Council (where China, like Russia, has a veto). Yet it is unlikely to press the matter. It has a keen interest in ending Afghanistan's role as a haven for Islamic terrorists, not least because it sees that as the source of much instability around the region, including in its own Xinjiang province. And it has an interest in improving ties with America after the collision in April between a Chinese fighter and an American surveillance plane off the Chinese coast.

China, too, has its own agenda. This week it pointedly called for America to help in its fight against “separatism”—a dig at continued American support for Taiwan. Despite official promises to the contrary, Chinese firms are as active as ever in supplying illicit technology to dodgy customers who may one day add to the threat the world now faces. America would like more co-operation from China in the fight against terrorism. But few people doubt that, in the longer run, America and China will remain rivals in Asia.

Outward, look

America has been redefined by disaster three times in the past 75 years. The first was in 1929, when the Wall Street crash began a decade of depression at home and isolationism abroad. That was halted by the second disaster: the Japanese attack on Pearl Harbour. Eventually, once war ended, the country saw 50 years of unparalleled domestic wealth and international engagement. This could be the third shock. There is clearly a risk that America could turn inward, driven by emotional horror at the evil the outside world can do. Yet, to judge by the first rallying of both government and people, almost the reverse is happening. America is seeing this tragedy as a reason to provide renewed leadership, to become engaged abroad, and to look resolutely outward for friends.

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The military options

Take your pick

Sep 20th 2001 | WASHINGTON, DC
From The Economist print edition

A tough set of choices

WHAT are the ways of fighting such a war? Michael O'Hanlon of the Brookings Institution offers four:

1. Kosovo-style air strikes against Afghanistan. This could be done by aircraft carriers in the Gulf (to where many extra combat aircraft have been sent) and/or stealth bombers flying from America. The combination of precision and heavyweight bombs could almost certainly destroy Mr bin Laden's camps and the Taliban's handful of military bases. But Mr bin Laden himself might well escape, along with much of his terrorism-planning staff. So might much of the Taliban's armoury—small arms, rocket-propelled grenades, 2,000-5,000 mortars and Stinger missiles that are deadly against helicopters.

2. Bombing other countries that help or shelter terrorists, not just Afghanistan. But the wider the attacks, the louder the protests in the Muslim world and elsewhere. The possible exception is Iraq. If Saddam Hussein were found to have been involved in last week's terrorism, attacks on his palaces and his Republican Guard might improve the chances of overthrowing him.

3. Invading Afghanistan. This would be the surest way of destroying the terrorists—if it worked. But it would require bases in either Pakistan or Iran, and preferably the help of their soldiers. Mr bin Laden might slip away. And, as both Britain and Russia can record, Afghanistan is no pushover. “Lice, dirt, blood,” is one Russian general's memory.

4. Commando raids plus support for the Afghan resistance. America has 5,000 Green Berets, 2,000 Rangers, 2,200 navy Seals and hundreds of men in the crack Delta Force. Britain has its own efficient special forces. Other countries might help. This is the likeliest way of killing or capturing Mr bin Laden. The anti-terrorism allies could also arm and train the anti-Taliban Northern Alliance, even though its leader, Ahmad Masoud, has just been killed. But Mr O'Hanlon reckons all this could take a long time, and cost hundreds of allied lives.

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Osama bin Laden's network

The spider in the web

Sep 20th 2001
From The Economist print edition

A trickier enemy is hard to imagine

AP

Get article background

TO MILLIONS of people in the western world, he has come to be viewed as the personification of evil. On the streets of Cairo, in the mountains of northern Pakistan, and even in the air-conditioned luxury of his native Saudi Arabia, he has many admirers, both open and secret.

But for foes and supporters alike, there is much about Osama bin Laden, the man at the centre of a network of Islamist violence spanning 40 countries, that remains enigmatic and contradictory. He was born in the heart of Saudi Arabia's privileged elite, but is now its harshest critic. As a young man, he became a popular figure within that elite because of his prominent role in the American-backed effort to succour the rebels who were battling Soviet forces in Afghanistan. But for at least the past 11 years—since American troops arrived in his country to wrest control of Kuwait from the Iraqis, and then stayed on after that war was won—he has regarded the United States and its allies with unqualified hatred.

His own religious roots are in the Sunni branch of Islam, and some of his followers have a history of bitter conflict with followers of Shia Islam, whose biggest stronghold is Iran. But he has insisted that differences within the Islamic world should be set aside for the sake of the broader struggle against western and Jewish interests. American officials say there is clear evidence of tactical co-operation between his organisation, al-Qaeda, the government of Iran, and Iran's proxies in Lebanon, the Hizbullah group. From the early 1990s, members of his group and its Egyptian allies were being sent to Lebanon to receive training from Hizbullah: an unusual example of Sunni-Shia co-operation in the broader anti-western struggle.

Thousands of would-be Islamist fighters from at least a dozen countries have received training at camps which he set up, at first in Sudan and, since 1996, in Afghanistan. But by no means all the beneficiaries of this training are under his control. And, to judge from the evidence that has emerged from three big trials in America over the past decade, many of the people who implement his plans have little idea who their ultimate boss may be. In Chechnya, for example, there is evidence of support (in the form of explosives, logistics and advice) from Mr bin Laden for the ultra-militant factions. But this tactical support for certain Chechens, according to Mark Galeotti, a British Russia-watcher, does not mean they are under his control.

The money behind him

AP

Mr bin Laden was born in Riyadh in 1957, the 17th of the 52 children of Saudi Arabia's most successful building magnate. His father, Mohammed bin Oud bin Laden, came from southern Yemen in 1932, when the kingdom's new dynasty was installed, and rose from humble beginnings to become the favoured building contractor to the royal house.

The bin Laden group is still the kingdom's biggest construction business, with a turnover of tens of billions of dollars. Its latest projects include airport facilities in Kuala Lumpur, a runway in Cairo and a vast new

mosque in Medina. Its recent investments have included a marble factory in Italy and a share in Iridium, a troubled satellite consortium.

How much of this fortune has flowed into Mr bin Laden's coffers? According to the State Department's list of terrorist organisations, he is “said to have inherited approximately $300m.” But others who know the Saudi royal house say this is a wild exaggeration. Since the early 1990s, he has been estranged from his family and from the Saudi government, which revoked his citizenship in 1994. The Saudi authorities have frozen his bank accounts and his share of the bin Laden fortune has been confiscated.

His handiwork

Some of the money lost then has, however, been replenished. Former officials of the CIA and the FBI say Mr bin Laden has been receiving secret donations from rich well-wishers in the Middle East and from Islamic charitable organisations. He may also take a cut from the Taliban's sales of opium. Units of his organisation are believed to raise money through financial and other sorts of crime. For example, Ahmed Ressam, an Algerian who plotted to bomb Los Angeles airport but later co-operated with American authorities, says he was given $12,000 of seed-money to set up his operation. When he asked for more cash, he was advised to finance himself by credit-card fraud.

In Sudan, where he established himself in 1991, Mr bin Laden launched several companies. One of these, the Al Shamal Islamic Bank, has a full website with a list of correspondent banking relationships, including institutions in New York, Geneva, Paris and London. He also set up agricultural and construction companies. But these operations, which in the past have built roads in Sudan, were designed primarily to secure the favour of the government rather than to yield high returns, says Vince Cannistraro, a former head of counter-terrorism at the CIA.

A former associate of Mr bin Laden's, Jamal al-Fadl, who fled to America after he was caught embezzling, described a complex operation with three committees, one military, one religious and one financial. Mr bin Laden and his supporters use business fronts and other means to move money secretly by wire and computer. Their financial sophistication is such that regulators and investment banks think it possible that they placed advantageous trades in the world's stock and derivative markets shortly before the attack on the World Trade Centre. The shares of three big insurers, France's AXA, Munich Re and Swiss Re, fell sharply in the days before. At the same time, volumes of put options (contracts that allow an investor to profit if shares fall below a specified level) on some airlines and other companies directly affected by the attack jumped beyond normal levels. An investigation is now under way.

What marks out Mr bin Laden from other godfathers of violence against western and Israeli targets is the extraordinary breadth of his connections. Bridging personal rivalries and ideological differences, he is prepared to make tactical alliances with almost any group that shares his aims: the “liberation” of his country and region from American troops, the replacement of pro-western regimes by militant Islamist ones, the defeat of Israel and the restoration of Muslim control over the holy places of Jerusalem.

He has sometimes been described as a Saudi agitator with an Egyptian base. Among the closest partners of his movement—forged in the Pakistani city of Peshawar, which was the home of the anti-Soviet resistance in Afghanistan—are the militant Islamist movements of Egypt. By early 1998, his core group of Afghan veterans had merged with Egyptian Islamic Jihad, a Cairo-based movement which includes the assassins of President Anwar Sadat in 1981. Since 1993 that group has avoided targets inside Egypt, but it bombed the Egyptian embassy in Pakistan and tried to bomb America's embassy in Albania. As a result of the merger, the “consultation council” over which Mr bin Laden presides includes the leaders of the Egyptian Islamic Jihad as well as his old comrades from Afghanistan.

Mr bin Laden has also co-operated closely with at least one wing of an even larger Egyptian movement, Gamaa Islamiya (the Islamic Group), whose spiritual guide, the blind cleric Sheikh Omar Abdul Rahman, has been in prison in the United States since 1995. This group, which killed 58 tourists in Luxor in 1997, declared a ceasefire in 1999, although this has since been renounced by the imprisoned sheikh.

In February 1998 Mr bin Laden summoned a prominent Egyptian fundamentalist, together with leaders of three other ultra-radical Islamist groups, to his base in Afghanistan. They agreed to form a new umbrella organisation, the World Front for Jihad Against Jews and Crusaders. The leaders issued a statement

asserting that America had, in effect, declared war against God by stationing forces on the holy soil of Saudi Arabia, besieging and bombing Iraq, and supporting Israeli oppression of the Palestinians. The statement concluded with a *fatwa* demanding that every Muslim comply with “God's order to kill the Americans and plunder their money.” This is the imperative that drives Mr bin Laden.

The making of a terrorist

Unlike many members of the Saudi elite, Mr bin Laden was never educated in the West, nor even at a western-run college in the Middle East. His only exposure to a cosmopolitan, western way of life was the two years he spent in the hedonistic atmosphere of Beirut after leaving school in 1973. While his brothers studied abroad, he took his degree in engineering in his home city of Jeddah; and he may perhaps have been influenced by the view of conservative clerics that Beirut's plunge into bloody civil war was a divine punishment for its decadent way of life.

Like tens of thousands of idealistic Muslims—and others—from all over the world, he seemed to find his vocation in the battle being waged by the mujahideen, a broad coalition of Islamic fighters divided into at least seven factions, against the Soviet forces that invaded Afghanistan in December 1979. He was uniquely well-placed to act as a conduit between the mujahideen and the kingdom because of his family's fortune and his personal contacts with the Saudi elite, including Prince Turki bin Faisal bin Abdelaziz, who was the Saudi intelligence chief for 24 years until his abrupt and unexplained dismissal a few weeks ago.

Shuttling between Peshawar, the Pakistani base for the mujahideen, and Saudi Arabia, Mr bin Laden raised huge sums of money and established a “services office” (*maktab al-khidamat*) which recruited fighters from all over the world—including the United States, where his men operated from an office in Brooklyn. According to American legal documents, the services office had metamorphosed—as early as 1989, the year the Russians left Afghanistan—into al-Qaeda, “the base”, which forms the core of Mr bin Laden's network of Islamist violence.

As a supplier of the Afghan rebels, Mr bin Laden was indefatigable. As well as procuring weapons and humanitarian aid, he obtained bulldozers and engineering equipment which were used to drive tunnels through the mountains of Afghanistan. Although most of his help was logistical and financial, he also saw some combat. In 1986 he was involved in the defence of a small village called Jadji, and in 1989 he was spotted by John Simpson, a British writer and broadcaster, among the forces besieging Jalalabad.

Support for the mujahideen was closely orchestrated between the governments and secret services of the United States, Britain, Pakistan and Saudi Arabia. A privileged recipient of American and Saudi aid (distributed by the Pakistanis) was the militant Islamic leader Gulbuddin Hikmatyar, with whom Mr bin Laden, in turn, was closely associated. The privileged treatment of Mr Hikmatyar—regarded as power-hungry and fanatical by other rebel groups—was viewed with some bafflement in the expatriate community in Peshawar, and it led to backroom arguments between American officials and their British partners.

Was there any privileged relationship between Mr bin Laden and the Americans? British officials with knowledge of covert operations in support of the Afghan rebels believed there was such a relationship, although this has been vigorously denied by their American counterparts. In any case, soon after the Soviet withdrawal from Afghanistan in 1989, Mr bin Laden became disillusioned with his erstwhile friends in America, Britain and the Saudi elite. He was dismayed by American support for Dr Sayid Mohammed Najibullah, an Afghan leader whom he viewed as a Russian stooge; and he bitterly opposed the arrival of American troops in Saudi Arabia in August 1990.

Emboldened by the prestige he had acquired as a powerful friend of the mujahideen, he became increasingly vocal in his criticism of the Saudi leadership—and an embarrassment to his friends and family. He was expelled from Saudi Arabia in 1991 and took refuge in Sudan, where he remained until that country, under international pressure, asked him to leave and return to Afghanistan, his old stamping-ground.

Foot-soldiers' evidence

The richest sources of publicly available information about Mr bin Laden, his network and methods have been a series of highly publicised trials in the United States over the past decade. Earlier this year, four

people were convicted by a New York court for their roles in the August 1998 bombing of the American embassies in Tanzania and Kenya, a double atrocity that cost 224 lives and apparently took five years to plan.

The court was told that one defendant, Wadih el Hage, had been linked with Mr bin Laden during the Afghan war in the early 1980s; a decade later, he was ordered by the Saudi godfather to bring Stinger anti-aircraft missiles (left over from American supplies to the mujahideen) from Pakistan to Sudan by air. Another defendant, a Tanzanian called Khalfan Khamis Mohamed, had played a role in the Dar es Salaam bombing but apparently had little knowledge of who was ultimately orchestrating it. As Peter Bergen, the author of a forthcoming book on the bin Laden network, puts it, “This confirms a pattern of foot-soldiers who know very little about the wider plan, and masterminds who are spirited out of the country immediately after, or even before, the attack takes place.”

The other court case which provided much information about Islamic terror was that of Ramzi Yousef, who, with half a dozen accomplices, was convicted of bombing the World Trade Centre in February 1993. His intention was to topple one tower against the other and release cyanide gas at the same time. In the event, a bomb went off but killed “only” six people.

AP

Ramzi Yousef, convicted

While his junior assistants were quickly apprehended, Mr Yousef himself fled the country to Pakistan. Later he moved to the Philippines, where he teamed up with a militant Muslim movement with links to Mr bin Laden. In the Philippines he conspired to kill President Bill Clinton and Pope John Paul; then, in January 1995, he plotted to blow up 11 American aircraft in a single day. The plot was thwarted only because of a fire in his Manila apartment; he was arrested a month later in Pakistan.

While it seems clear that Mr Yousef had received support from Mr bin Laden's network before the February 1993 bombing, and that he co-operated with close associates and allies of Mr bin Laden over the next two years, his precise relationship with the Saudi boss remains unclear. One American Middle East scholar, Laurie Mylroie, has argued that there are strong grounds for believing that Mr Yousef was an agent of Iraq. She blames poor co-operation between America's Justice Department and intelligence agencies for the authorities' failure to follow up the evidence.

Whether or not Mr Yousef has an Iraqi connection, his story is a striking example of the grey area in which Mr bin Laden operates. Mr Yousef has a record of support for Sunni Muslim groups which bitterly oppose the Shia branch of Islam; Mr bin Laden, by contrast, believes that all Muslims should work together against their enemies. Yet this did not seem to prevent Mr Yousef from co-operating with the bin Laden network.

Other tantalising details of the bin Laden apparatus—and the military training it offers in Afghanistan—emerged during a separate hearing in New York on the conspiracy by a group of Algerians to set off a suitcase bomb at Los Angeles airport at the turn of the millennium. Ahmed Ressam, a conspirator who gave evidence for the prosecution, disclosed that he had received six months of training at a camp in Afghanistan in 1998, along with volunteers from many other places including Algeria, Jordan, Yemen, Saudi Arabia, France and Chechnya.

The witness said he had been trained in how to blow up the infrastructure of a country—“airports, railroads, large corporations” as well as how to wage urban warfare by blocking roads, storming buildings and assassinating individuals. One of the men convicted in the embassy-bombings trial, Mohamed al-Owhali, had been trained in the same camp, while two other defendants had received instruction at a different training-ground in Afghanistan.

How to get him

Officials in America and Europe believe that stifling Mr bin Laden's financial network would help to stop more attacks. But that will be difficult. Although it is possible to pinpoint and freeze accounts held in America and Europe, seizing assets held in the Middle East under names not directly related to Mr bin Laden's organisation is far harder. When Mr bin Laden realised that intelligence agencies were pursuing his financial arrangements, he started to rely more heavily on cash, which leaves no trace. His global network may use an internal credit system similar to those employed by the Mafia and Triad gangs, says

Magnus Ranstorp, a terrorism expert at the University of St Andrews. Like cash, it leaves no audit trail. “We will never be able to cut off his funds entirely,” says Mr Cannistraro; “only restrict them.”

The biggest nightmare is that Mr bin Laden and his associates will acquire, or have already acquired, biological, chemical or even nuclear weapons. American legal documents allege that his supporters have been looking for nuclear materials since the early 1990s. Another risk, says bin Laden-watcher Yonah Alexander, is that of devastating cyber-warfare. And even if the man himself is somehow neutralised, plenty of militant Muslims will be ready to struggle on in his name—with or without direct orders from their hero.

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Islam's tensions

Enemies within, enemies without

Sep 20th 2001 | CAIRO
From The Economist print edition

Reuters

Islam remains a tolerant faith, despite its apparent new ferocity

LIKE every great religion, Islam is, and has been for all but the first of its 1,400 years, a varied and fractious faith. Muslims do not differ on essentials such as the oneness of God, the literalness of his word as voiced by Muhammad, or the duty to perform prayer, charity, fasting, pilgrimage and *jihad*, which means something like “struggle”. There is not much debate over the first four of these duties, though quite a few Muslims choose to ignore them. But the last, which embraces everything from resisting temptation to attacking Islam's perceived enemies, is a much more contentious term.

Nearly all Muslims, almost all the time, lean to the softer meaning. They think of *jihad* as striving to perfect oneself, or to give hope to others by good example. In short, they get on with their lives much like anyone else. When the faith is under threat, however, some may be inspired to go further—to fight to expel crusaders from Palestine, say, as Muslims did in the 13th century, or to kick Russians out of Afghanistan, as they did in the 1980s. A few may go to greater extremes. Some, for example, follow the teachings of a 14th-century firebrand, Ibn Taymiyya, who stated unequivocally, “*jihad* against the disbelievers is the most noble of actions.” And some of these, a tiny radical minority, may go so far as to plot carefully, and execute fearlessly, a suicidal slaughter of thousands of innocents in the name of Allah.

Yet such a calamitous misdirection of energy can occur only under certain conditions. The sense that the faith is under threat must be strong enough, and widely enough perceived, to provoke real fear and anger. Leaders—men with the charisma and credibility to warp the words of Islam's founding texts to suit their own convictions—are needed to channel noble thoughts into ghastly deeds. There must be a pool of recruits who are so frustrated by, or so blinded to, the other options of this world that their minds remain concentrated on the next. And there must be proper logistical underpinnings: easy access to transport, communications and information, and skill at using them.

Reuters

More religious need not mean more violent

Tragically for America, and just as tragically for Islam, the modern age has generated all these conditions at once. A modicum of money and education can now provide anyone with the means of rapid movement, organisation and proselytising, as well as the capacity to cause immense destruction. A sense of being under threat is now shared, to some degree, by many sects in many religions. From Buddhist monks to Jewish Hasidim to left-wing Luddites, there is no shortage of voices decrying such alleged ills as materialism, secularisation, sexual permissiveness, or the drowning of cultural variety in the tide of globalisation.

Because most such groups are marginal, their Utopian yearnings are diluted. In the case of Muslims, however, history and numbers combine to magnify the grudge many hold against their present fate. The judgment of Samuel Huntington, the Harvard scholar who ignited controversy with a 1993 article entitled “The Clash of Civilisations”, was cruel and sweeping, but nonetheless acute. Today, he wrote, the world's billion or so Muslims are “convinced of the superiority of their culture, and obsessed with the inferiority of their power.”

Post-colonial wounds

European colonialism was not entirely a bad thing. It created nations where there were none before, in America and Africa. It shocked the resilient old cultures of Asia into modernity, and ended up freeing India's Hindus from centuries of Muslim overlordship. But colonialism and its aftermath fractured the Islamic world both horizontally and vertically. Rival states replaced its congenially porous old empires. Impatient, western-minded governments dropped Islamic law in favour of imported systems. This brought genuine progress, yet it also cut the chain of rich tradition that linked present to past, and ruptured the old Islamic notion of unity between religion and state which, in theory at least, tied the temporal to the eternal. To the pious, Islam seemed to have been cast adrift from its own history.

Modern Islamism, a term that describes a broad range of political movements, most of them peaceable, some aggressive, is a product of this sensibility. From Egypt's venerable Muslim Brotherhood, founded in 1928, to the brutal *maquisards* of present-day Algeria, what unites these groups is a determination to save Islam, to recapture the reins of its history. Like the religious right in the United States, or for that matter in Israel, Islamists seek to return religion to centrality, to make faith the determining component of identity and behaviour.

The past three decades have provided fertile ground for these ideas. Nearly every Muslim country has experienced the kind of social stress that generates severe doubt, discontent and despair. Populations have exploded. Cities, once the abode of the privileged, have been overrun by impoverished, disoriented provincials. The authoritarian nature of many post-colonial governments, the frequent failure of their great plans, and their continued dependence on western money, arms and science have discredited their brand of secularism. The intrusion of increasingly liberal western ways, brought by radio, films, television, the Internet and tourism, has engendered schism by seducing some and alienating others. Growing gaps in wealth, both within Muslim societies and between the poor nations of the Islamic world and the oil-rich Arabian Gulf, have spawned resentment, too.

Islam has also suffered external stresses. Although the post-colonial fires troubling much of the globe have now subsided, the Muslim world's wounds continue to fester. In the past decade alone a score of conflicts have simmered on its borders. These range from ethnic war in the Balkans, to militant insurgency in the Philippines, to what sometimes looks like anti-colonial revolts in Chechnya, Kashmir and the Palestinian territories.

The Palestinian struggle, in particular, has stoked rage against not only Israel and its backers, pre-eminently the United States, but also the feebleness of Arab and Muslim governments in the face of them. Even conflicts that did not at first involve religious adversaries have, in the minds of many, taken on religious overtones. America's continuing strikes against Iraq and, in particular, the persistence of sanctions, have aroused widespread anger.

This sudden accumulation of woes has reinforced the notion that Islam itself is somehow in danger. For the first time in the modern world, a sense of Islam as a whole, as a nation or a polity, has marched back upon the stage.

A stiffening orthodoxy

In response to all these pressures, the outward nature of the faith has changed. A religion that once included diverse strands of mysticism, and even of mild paganism—especially in countries like Indonesia, whither Islam was borne by traders, not conquerors—has begun to harden around a very rigid textualism. Money, migrant labour and the pilgrimage to Mecca have spread far and wide the Saudis' bleak desert version of Islam. To the dismay of many Muslims, this doctrine, one stripped of subtlety, nuance and compromise, is being presented as a new orthodoxy.

This hard-edged modern Islam has produced a new kind of preacher. As the clerics of the Ottoman empire foresaw five centuries ago when they banned printing, the spread of literacy has ended the professional scholars' monopoly on interpreting religion. Their hold, already undermined by their association with unpopular regimes, is further weakened by the dispersion of Muslims in small communities around the globe, communities that are often isolated among non-believers. Amid the general dislocation, staid supporters of the older tolerant ways are often shouted down. The increasingly dominant voice is an angry one that sees Islam as a beleaguered faith, surrounded by enemies without and within.

And yet the emotionally charged, electronically amplified tone of today's mosque sermons still has only limited influence. Islam remains a diverse and broadly tolerant faith. A growing number of Muslims, better educated than their forebears and far more exposed to alternative ways of life through television and the Internet, rather like much that is on offer. They want a chance, naturally, to have a bigger share in the modern world's material comforts. More important, many of them are attracted by the idea of individual responsibility, the notion that each person has the right to think his or her own way through life's problems. The Muslim world, in short, may be starting to grope its way towards its own Reformation.

At the same time, the painful experience of countries such as Iran, Algeria and Egypt has convinced many that excessive zeal is misguided. The Taliban's blinkered atavism, for example, is abhorrent to nearly everyone else. Its destruction of ancient Buddhist monuments earlier this year was condemned by virtually every Muslim authority in the rest of the world.

In Arab countries generally, the ultra-radical fringe has seemed to be shrinking. Most Arab governments have long since recognised the threat it poses. Concerted and often brutal policing has decapitated most of the extreme groups. Some organisations that were once considered dangerously radical, such as Lebanon's Shia militia, Hizbullah, have moved into the mainstream. Even Egypt's Gamaa Islamiya, an organisation that wrought havoc in the early 1990s, has renounced violence, although its jailed leader has since wavered. To most Muslims, the contention of Osama bin Laden and his followers that God has ordered Muslims to kill Americans is not only silly, but presumption bordering on heresy.

In all but a few cases, the inroads made by Islamism are reflected not in violent extremism, but in an increased religious consciousness. Muslims today are in general more knowledgeable about their faith, more attuned to its demands, and more assertive about their identity.

But which direction does this assertiveness take? Does it tend to inward *jihad*, or offensive *jihad*? This is a question that must be settled, in the long run, by the people of the Muslim world themselves, and by their success or failure at making their societies better ones to live in. If they succeed, there will be no place for the bin Ladens of this world. Historically, Islam has reserved its greatest wrath not for outsiders, but for heretics.

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The home front

Getting to grips with evil

Sep 20th 2001 | WASHINGTON, DC
From The Economist print edition

AP

America is settling down for a long, hard fight

Get article background

THE whole country is aflutter with flags. They fly at half-mast from federal buildings. They fly from every other house and car you pass as you walk down the street. Huge flags decorate sports stadiums, tiny ones dangle from baby carriages. Wal-Mart and K-Mart have sold more than half a million flags in the past week.

These are only the most visible signs of a wave of patriotism that has washed across the country after last week's attacks. When George Bush visited rescue workers in lower Manhattan, they broke into spontaneous chants of “USA, USA”. One of the fastest-selling music albums at the moment is a five-year-old collection by Lee Greenwood, “God Bless the USA.”

As well as patriotism, people are seeking solace in religion. Churches, synagogues and mosques are full to overflowing. Worshippers jammed into them on Friday, September 14th, for a national day of remembrance, and then again on Sunday. In his sermon in Washington's National Cathedral, Mr Bush recalled Franklin Roosevelt's phrase about “the warm courage of national unity”. People have given more blood than the wounded need, and more food than can be consumed.

But this warm courage turns hot on the question of retribution. The opinion polls show nine out of ten Americans backing military action, and being willing to make whatever sacrifices are necessary so that this sort of thing does not happen again. The word “war” is heard everywhere. It speaks not just of the challenge ahead but of the blow that has already hit the country. In Vietnam, 50,000 Americans lost their lives in ten years: more than a tenth of that number died in one hour on September 11th. Americans feel physically threatened in their homeland for the first time for more than a century.

Politicians are gripped by the same instinct for national unity. Congress, which only narrowly approved the war that Mr Bush's father waged against Saddam Hussein, is burying partisan differences. The Senate passed a resolution authorising the use of force without a single dissenting vote; the House vote was 420-1. The Senate also swiftly confirmed John Negroponte's nomination as ambassador to the United Nations. The tragedy even seems to have reunited Bill Clinton and Al Gore, who spent most of a day together discussing it.

Even as normality returns—restaurants fill up, sporting events restart, ads edge their way back into news programmes—there are reminders that some things may never be quite the same again. Fighters and helicopters patrol the skies above Washington. Security at all nuclear power plants and most

hydroelectric dams has been increased dramatically. Nine units of the National Guard that specialise in germ warfare have been sent to selected locations, in their first-ever mobilisation. Major-league baseball has banned parking within 100 feet of its stadiums.

At the state and city level, the possible costs of political patronage are coming under closer scrutiny. At Boston, where both flights that hit the World Trade Centre originated, the terrorists apparently nosed around the airport for several weeks before the attack; one may even have slipped into the airport's control tower. The Massachusetts Port Authority, which runs the airport, has been called “a cesspool of patronage”. Its security chief and executive director used to be, respectively, a driver and press aide to a former Massachusetts governor, William Weld.

Will the solidarity last? There is a “peace movement”, but still a tiny one (see article). Leftist critics of “superpower imperialism” who have hinted that America may be somehow reaping what it has sown have been disowned. Right-wing mavericks who have challenged the national mood have also got short shrift. Jerry Falwell's argument that homosexuals, lesbians, feminists and civil-liberties supporters “helped this happen” was treated with derision even by fellow conservatives.

Yet partisan politics is bound to return *sotto voce*. Despite the agreement to prise open the Social Security lock-box to pay for the damage, there are disagreements about how to stimulate the economy (see article). Despite the rallying around Mr Bush, Congress was reluctant to give the commander-in-chief open-ended approval for any military action whatsoever.

The home front is going to be enormously important. This will not just be a war conducted in a faraway land; it will be partly fought at home. Even if it wins abroad, America cannot then up sticks and go home. The enemy also sits within the gates, inside these United States.

In the coming months there will be a vital debate on two key issues. The first is the proper balance between freedom and security. Some erosion of civil liberties is inevitable. But how much is tolerable in the land of the free? A diverse collection of pressure groups and civil-rights organisations—including the National Association for the Advancement of Coloured People, the American Civil Liberties Union and the libertarian Cato Institute—are joining forces to fight legislation they think will undermine people's rights.

The other is the ethics of war. Support for the war is bound to wobble if American troops start to come home in body bags, and if civilians get killed. The current support for a war drops to 75% if it leads to civilian casualties. The “liberal media”, which many of Mr Bush's people despise but which so far have backed the president to the hilt, may begin to defect.

But that is as it should be on the home front. The essence of a free society is that it should disagree strenuously about things that matter. The terrorists calculated that America had gone soft. There has been nothing soft about the courage and self-sacrifice of the rescue workers, or the resolve of people across the country to wage war on terrorism. The terrorists thought they would reveal the hidden vulnerabilities of a free society. They have ended up revealing its hidden strengths as well.

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The economic impact

How big a blow?

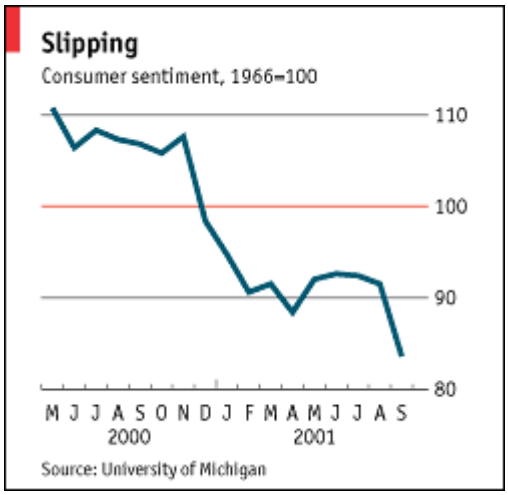
Sep 20th 2001 | WASHINGTON, DC
From The Economist print edition

As the United States gets back to business, attention has turned to measuring—and minimising—the economic fall-out

SHAKEN but grimly determined, America went back to work this week. It also began to focus on the economic consequences of the terrorist attacks. In a few industries, notably aviation (see article), jobs have already been shed. The broader effect could well be to push an already wobbly economy into recession.

Last week much economic activity ground to a temporary halt. Some distribution bottlenecks continue, as security is stepped up from borders to airports. But in an economy with plenty of excess capacity, the impact of such supply disruptions should prove small. The immediate concern is how events will affect business and, especially, consumer spending. The longer-term effects depend on whether Americans have to change the way that they conduct business.

There are several reasons why the immediate fall-out could be sharply negative. First, the economy was already on the edge of recession. Investment and profits in American businesses have been falling. Industrial production fell by 0.8% in August, the 11th consecutive monthly drop. Unemployment claims and job lay-offs have been rising. Hours worked have been falling. Even before September 11th, the stockmarket was down sharply. The University of Michigan survey of consumer sentiment, collected before September 11th and released on September 13th, showed a dramatic drop in confidence (see chart), to an eight-year low. All these factors suggested that the debt-laden, erstwhile spendthrift American consumer was finally set to retrench.



September 11th's events made each weakness more acute. Stocks fell a further 7% when markets reopened on September 17th. The airlines and Boeing have together announced more than 70,000 job cuts; more are likely. Though there are, as yet, no new gauges of consumer confidence, it has surely fallen a lot. In 1990, after Saddam Hussein invaded Kuwait, the Michigan index tumbled 13 points, heralding a sharp drop in consumer spending. Most economists on Wall Street now expect the economy to contract in both the third and fourth quarters.

Yet conventional wisdom also expects this recession to be short-lived, with a strong V-shaped rebound by the middle of 2002. That confidence is predicated on two assumptions. First, that last week's horror will remain a one-off, and that its confidence-shattering impact will gradually diminish. Second, that the economy will get a big boost from further monetary and fiscal stimuli.

So far, that is exactly what Washington's policymakers are doing. The Federal Reserve pumped an unprecedented $100 billion of liquidity into the economy last week. And, before the stockmarkets opened on Monday, it cut America's key short-term interest rate by a further 0.5 percentage points, to 3%. The accompanying statement suggested the Fed stood ready to provide more liquidity, and that more rate cuts could be in the offing.

Congress, too, reacted with alacrity. The political rows about keeping the Social Security surplus in a lock-box were immediately forgotten. By September 14th, lawmakers had coughed up $40 billion for the costs of recovering from and responding to the terrorists' attack. Some $10 billion was made available

immediately; another $10 billion will be provided once President Bush says how he intends to spend it; and $20 billion could be put into the budget for fiscal 2002, which begins on October 1st. The amount involved is already higher than that needed for this year's much ballyhooed tax rebate, and most lawmakers regard the $40 billion as only a down-payment.

Airline managers at first asked for $24 billion in aid. As *The Economist* went to press, they looked certain to get $5 billion in cash, with the promise of much more in loan guarantees and other forms of aid. Other hard-hit industries—especially insurance—have asked for help.

Lawmakers are also discussing more tax cuts to boost investment and spending. Bill Thomas, the Republican chairman of the House Ways and Means Committee, wants the capital-gains tax rate to be reduced. Others want investment tax credits and accelerated depreciation schedules. Democrats think this is a Republican ploy to deliver long-promised tax breaks to business. They would rather stimulate demand by giving tax cuts to consumers who will spend the money quickly—meaning poor Americans. One option is a one-time rebate in the payroll tax that finances Social Security.

Given that America is running a sizeable fiscal surplus, there is plenty of room for a big fiscal stimulus—as long as it is a temporary one. Any package will need to take into account the longer-term fiscal demands of an ageing population, particularly as baby-boomers retire. That suggests caution with large, permanent tax cuts.

In the long term, a more profound set of economic consequences could flow from the protracted and painful war on terrorism that America's politicians have promised. Permanently heightened security within America and on its borders could raise business costs and reduce productivity. Prolonged military action against a shadowy foe could push up the risk premiums that investors will demand.

America's underlying economic strength has been based on global integration as well as technological innovation. If either is undermined in the new world, the economic impact could be grave.

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New York city

Waiting and praying

Sep 20th 2001 | NEW YORK
From The Economist print edition

Despite its comradely bravado, the city's problems look immense

AP

The clean-up continues

NEW YORK, outsiders like to complain, has never been typical of America. The Big Apple's over-sophisticated ways, its general unfriendliness and its rampant individualism all supposedly set it apart. The tragedy at the World Trade Centre has changed all that, unlocking the sort of community spirit for which small towns across the country are rightly famed.

Shrines of flowers and candles have been created outside the city's fire stations by well-wishers honouring the estimated 344 firefighters who lost their lives last week. Home-baked cakes and cookies have been delivered to police stations. Tons of clothing and footwear have been given to the rescuers, whose existing gear has been ruined, not least by the foul, sooty smoke which continues to hang over “ground zero”. When the Yankees and Mets, the city's major league baseball teams, resumed playing this week, the players wore caps carrying the logos of the city's fire and police departments.

The city remains numbed. Frequent bomb scares do not help. Everybody knows of somebody who died, or remains missing. Worst of all, there has been the lack of good news from the rescuers.

Nobody has been pulled alive from the rubble since the day after the attack. Worse, the slow pace of recovery of the bodies—fewer than 250 out of the 5,400 missing, after a week of searching—has led to the growing realisation that many of the victims may have been cremated, never to be identified. It may be six months before all the rubble is cleared, and the body count completed. The awareness that the lost are real people, not anonymous statistics, has been deepened by the photocopies of the missing that adorn every bus shelter, public telephone or hoarding.

Showing the flag—again something that New Yorkers tend to do less than other Americans—has become an important sign of defiance. The Stars and Stripes flies pretty well everywhere you look.

In a few cases, this has less to do with patriotism than with intolerance. In Queens, a Dunkin' Donuts and a candy store have become the target of an e-mail boycott for refusing to fly the flag. Many Arab and (turban-wearing) Indian and Pakistani taxi-drivers are prominently displaying Old Glory. One Egyptian driver, asked why he was not displaying his name-card, confessed that it was because his name is Osama. Some female Muslim students at Columbia University have discarded their hijab headscarves.

New York's leaders, notably Rudy Giuliani, have been doing all they can to stop the melting-pot boiling over. But a growing part of Mr Giuliani's job seems to be the slog of trying to revive the city's hard-hit economy. This week he urged Americans who want to help the city to visit it, “spend some money” and “go to a play”. Plummeting attendance figures have already caused four Broadway shows to announce the end of their runs.

The virtual evaporation of the city's normally plentiful tourist population has also left many restaurants and hotel rooms empty. Some hotels report occupancy rates of below 20%. Some 3,000 members of the Hotel Trades Council, a hotel workers' union, have been laid off.

Many conferences scheduled for later this year have been postponed or cancelled, including Fashion Week—a totem for the city's huge garment industry. Less glamorously, the disaster also knocked out the Fulton fish market; restaurants and other buyers are already beginning to buy their fish outside the

island.

The city's leaders—and its huge property industry—must hope that the tourists and the fish are not the start of a permanent trend. There is talk that some of the financial firms which have been obliged to move their operations outside the city in the past week, notably in New Jersey, may never return. And, although they do not like to seem disloyal at this time, many New Yorkers (especially those with young children) seem to be talking privately about moving somewhere less likely to be a terrorist target.

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Dissenting voices

Give peace a chance?

Sep 20th 2001 | NEW YORK
From The Economist print edition

Probably not

EVEN before a war has started, a peace movement has raised its head. Union Square, about two miles from the still-smoking World Trade Centre, has become a place of round-the-clock vigils not just condemning the terrorist attacks, but calling on America to hold back from violent vengeance. Flyers and posters carry peace slogans, from the old ("Give peace a chance") to the new ("An eye for an eye and everyone is blind").The equestrian statue of George Washington now holds a white banner with a peace symbol.

Some of the protesters see American foreign policy as the root of the terrorism. By arming Israel and bombing Iraq, they claim, America has helped to breed the suicide bombers. "Every bomb dropped creates 1,000 more bin Ladens," says a placard in Union Square. They now worry that America's armed forces may be about to hit targets in poverty-stricken and oppressed parts of Afghanistan.

Another strand of the peace movement plainly has its roots in the weirder parts of the anti-globalisation movement. One website has blamed the "failed and anachronistic military-industrial economy" for creating global inequality and, as a result, extremism and violence. Another website is dedicated to "resistance against Militarism, War and Corporate Greed".

Will it amount to anything? The various websites, chat groups and chain e-mails are soon to be matched by a series of vigils and marches planned for Washington, DC, New York, San Francisco and Los Angeles. But the opinion polls show that Americans are overwhelmingly in favour of a military response. The single member of Congress who voted against authorising military action, Barbara Lee, a Californian Democrat who represents peace-loving Oakland and Berkeley, has been given extra police protection at the Capitol. For the moment, there are a lot more hawks than doves in America.

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Arab-Americans

Suddenly visible

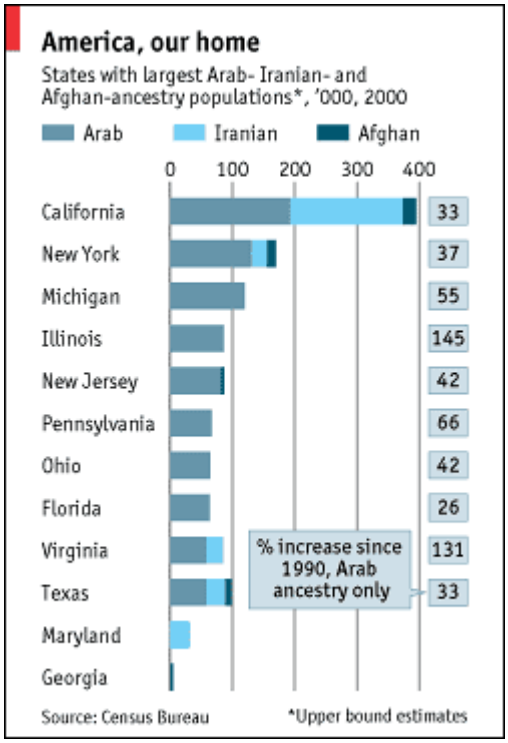
Sep 20th 2001 | BROOKLYN AND SAN FRANCISCO
From The Economist print edition

The stereotype of one of America's minorities needs to be updated

"I AM here for peace." So explains an Egyptian imam at a rally of Brooklyn's Muslims. Thousands, both Muslims and non-Muslims, joined him on Brooklyn's promenade, with its unmatched view of lower Manhattan, to denounce not only the terrorist attacks but also any rush to judgment against Arabs and other Muslims. There was a prayer for the dead in Arabic, chants of "peace-salaam-shalom", and the singing of "We Shall Overcome" and "God Bless America".

So far the fear of a widespread reaction against Muslims in America seems misplaced. To be sure, Arabic-looking people have been the target of insults and violence, including at least two murders, since the attacks. But the harassment has not been much worse than after earlier terrorist attacks on Americans, such as the 1993 bombing of the World Trade Centre.

For this Arab-Americans partly have to thank George Bush, who issued a passionate plea on their behalf at an Islamic centre in Washington, DC. But the 3.5m Americans with some Arab heritage themselves have plenty of clout.



It begins at the ballot box. Richer and better educated than the national average, Arab-Americans are classic swing voters who often live in swing states. When Walter Mondale ran for president in 1984, he was so scared of alarming Jewish voters that he turned down contributions from Arab-Americans. Last year both Al Gore and Mr Bush visited Detroit, which has the largest concentration of Arab-Americans in America, to seek their votes to win the state of Michigan. And Ralph Nader, whose parents came from Lebanon, won 3% of the presidential vote.

Mr Nader's politics may be atypically left-wing: most Arab-Americans have conservative views on subjects such as abortion and school vouchers. But, if there is such a thing as a typical Arab-American, the Christian, well-educated, American-born Mr Nader is much closer to the norm than the image peddled by Hollywood.

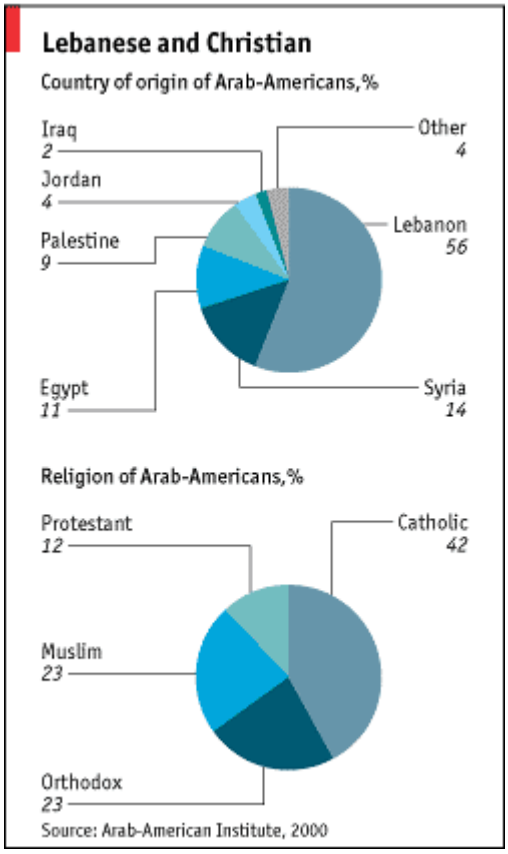
Four in five Arab-Americans were born in the United States. Almost all trace their origins to one of two large waves of immigration. The first started at the end of the 19th century, and consisted mainly of Lebanese Christians from what was then Greater Syria. Many of them travelled the country selling clothes and other necessities to remote farms. In time, they settled down and opened shops, some of which have grown into big clothing or retail businesses. Other Lebanese immigrants flocked to the factories of Detroit and Henry Ford's offer of $5 a day.

The second wave of Arab immigration followed the reopening of America's gates to immigrants in 1965, and increased after the 1967 Arab-Israeli war. This wave was more diverse than the first, including Palestinians, Yemenis and others fleeing from oppression in their home countries, such as Christians and Shias from Iraq. They have tended to gather in big cities, not only Detroit but also Los Angeles, New York, Chicago and Washington.

Because of all this, Arab-Americans are notably different from Arabs in the Middle East. One striking difference is that three-quarters of Arab-Americans are Christians, compared with only 5% of Arabs in the Middle East. Further to confound the stereotypes, the largest contingent of America's 6m Muslims is black, not Arab.

James Zogby, a pollster who founded the Arab-American Institute (AAI) in 1985, says that recent research by the institute found that 42% of the respondents preferred to be called “Arab-American”. In the past, most would have referred first to a particular country or even town in the Middle East to define themselves.

Yet events in the Middle East still help to define Arab-Americans. Their influence within America is limited, they feel, both by their country's overwhelming commitment to Israel and by the coverage their kith and kin receive in the media. Three-quarters of Arab-Americans, according to a poll by the AAI last year, thought American policy was biased towards Israel. Nine in ten wanted a Palestinian state, and just over half wanted their country to lift sanctions on Iraq.



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About sponsorship

Who did it?

The manhunt begins

Sep 20th 2001 | LONDON AND SAN FRANCISCO
From The Economist print edition

It is revealing a lot that should have been known already

THE investigation into the perpetrators of last week's terror attacks is the largest ever mounted, embracing thousands of agents in America and detectives in dozens of countries stretching from Germany to the Cayman Islands. They are working backwards from airline tickets and hired-car receipts to try to reconstruct the network that put the attack together. In the course of doing so, they are turning up some alarming evidence of possible other attacks narrowly avoided and of threats still ahead—and also of clues missed or ignored that might have rung warning bells.

The trail starts with the men who took over the four airliners hijacked on September 11th. Within three days, the Federal Bureau of Investigation (FBI) released the names of 19 men it believed had mounted the attacks and then died along with their victims. Several had been in the country illegally and were wanted by the Immigration and Naturalisation Service. Two were already sought by the FBI, but had eluded detection before boarding their flights.

Since then, the lines of inquiry have fanned out from credit-card records and other information about these 19 men. A week after the attack, investigators had 96,000 leads. Some of these will prove mistaken—confusion over similar names has led to some innocent Saudi Arabian airline pilots coming under suspicion. Some leads may be red herrings left by the terrorists to confuse the chase. But several have already pointed to further suspects.

Besides the 19 dead men, investigators believe that a further 30 or so conspirators contributed directly to the attacks. Some may have intended to crash other planes themselves. The FBI wants to question passengers on an American Airlines flight that had been due to leave Boston for San Francisco at 9 o'clock on the morning of the attacks, but had been delayed, so that it was still sitting on the runway at 9.25, when the Federal Aviation Authority grounded all flights. Some passengers never returned for the rescheduled flight.

More than 80 people have already been detained, and the FBI has a list of another 200 it wants to question. Most of those detained are being held on the ground of “immigration concerns”. There are now new rules extending the length of time for which visa violators can be held.

One of the most intriguing subjects of investigation did not need to be tracked down, since he was already in custody. Zacarias Moussaoui, a French-Algerian, had been picked up in Minnesota on August 17th for carrying a false passport. What has really caught the authorities' eye (somewhat belatedly) is that after taking a few flying lessons and failing to qualify as a light-aircraft pilot, Mr Moussaoui offered a flight school large sums in cash to spend time on a jumbo-jet flight simulator. He was said to be interested only in learning to steer, not to land. Since the attacks he has been moved to a jail elsewhere, but has refused to talk.

Other warnings went unheeded. In August, Mossad told the CIA that up to 200 terrorists were slipping into the United States to attack a big target. Three weeks ago an anonymous letter to a radio station in the Cayman Islands said that three Afghans who had just been arrested for entering the Caymans illegally might be involved in plans by Osama bin Laden to attack airlines in America.

Police in Hamburg have raided flats once lived in by three of the attackers before they moved to America, and British police are investigating reports of a terrorist training network in their country. Also in Europe, suspicious financial transactions in the week before the attacks have opened up another possible trail. Short-selling—transactions designed to profit from future drops in prices—was unusually intense in shares in reinsurance firms. Insurance shares fell after the attacks. Investigators will try to find out who

it was that showed such sinister prescience.

Several clues point to Mr bin Laden. Mr Moussaoui is thought to have made several visits to Afghanistan in the 1990s. Mohamed Atta, one of the suicide pilots, apparently had links to Egypt's Islamic Jihad, a group allied with al-Qaeda, Mr bin Laden's network; Atta also met an Iraqi officer in Europe this year. Khalid al-Midhar, another hijacker, was filmed last year in Malaysia meeting a man later linked to a suicide attack on the *USS Cole*, an American warship, in Yemen last October, which Mr bin Laden is thought to have ordered. All this is suggestive. It is not yet proof.

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Surveillance technology

Uncle Sam and the Watching Eye

Sep 20th 2001
From The Economist print edition

Will terrorism change Americans' minds about surveillance technology?

THE first casualty of war is supposed to be truth, but after last week's terrorist attacks many libertarians fear that, this time, the first victim will be privacy. Watchdog organisations and pressure groups worry that the threat of terrorism will be used as an excuse to install new surveillance technology, both in the real world and on the Internet, that would otherwise have aroused fierce opposition.

Over the past few months there had been a growing backlash in America against the installation of “smart” closed-circuit television (CCTV) systems in public places. In January, a smart CCTV system was used to scan the faces of the 72,000 people going to watch the Super Bowl in Tampa, Florida, as they passed through the turnstiles of the Raymond James Stadium. Their faces were covertly compared with a database of known criminals, using a facial-recognition system. When details of the operation emerged, it was condemned by civil-liberties groups, who called it “snooper bowl”. The recent installation of a similar system to scan the faces of pedestrians in Ybor City, Tampa's entertainment district, has been denounced as “digital frisking” that makes pedestrians take part in a “virtual police line-up”.

Over the summer, newspaper columnists repeated the message: unless Americans took a stand, their country would soon come to resemble Europe, where use of CCTV is far more prevalent. Face-scanning systems have been installed in a number of European city centres, shopping centres, sports stadiums and airports. As in Tampa, such systems are routinely justified on anti-terrorism grounds, and encounter little opposition in places such as Britain and Spain, whose citizens are used to living with the threat of terrorism. When a system to scan the number plates of all cars entering and leaving the City of London was introduced a few years ago, Londoners accepted it without protest.

Now that they too face the threat of terrorism in their own country, will Americans change their minds about surveillance technology? There is some evidence that they might. Joseph Atick of Visionics, a maker of facial-recognition systems, says that his company has been deluged with calls since last week's attacks. Journalists who previously wrote damning articles about the technology have called to apologise, he claims, and law-enforcement agencies seem to have forgotten their earlier worry that introducing the technology would bring a public outcry. Visionics has installed new telephone lines to cope with the volume of enquiries; its share price (along with that of rival equipment makers) has doubled.

To privacy advocates, this is deeply troubling. Cindy Cohn of the Electronic Frontier Foundation, a civil-liberties group based in San Francisco, argues that facial-recognition systems are liable to suffer from “mission creep” as the database of suspects is broadened. Richard Smith of the Privacy Foundation points out that the “snooper bowl” incident was explained as an anti-terrorist measure, but that the 19 suspects identified by the system were pickpockets and ticket scalpers. “They say they're putting these systems in to stop people from getting killed, and end up using it for something else,” he says.

Ms Cohn is concerned that measures dramatically extending the scope of telephone- and Internet-wiretapping were proposed and passed by Congress within half an hour last week. And, she notes, there have already been calls for restrictions on the use of encryption technology, which allows Internet users to encode e-mails so that they cannot be read by anyone except the recipient. Bruce Schneier, an Internet-security expert, says he expects surveillance to become far more widespread. Disliking this, he quotes Benjamin Franklin: “They that can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety.”

Yet, as Mr Atick points out, to most people the threat of terrorism seems real, whereas the danger that surveillance technologies will be misused seems theoretical. Privacy advocates will now find it much harder to oppose such systems. So they are likely to become far more prevalent as Americans accept a

new balance between security and privacy.

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Lexington

A leader is born

Sep 20th 2001
From The Economist print edition

George Bush is finding his voice—just as Harry Truman once did

A WAR against terrorism would test the abilities of even the most experienced president, let alone a clumsy-tongued neophyte whose main contribution to foreign policy until last week, many people said, was to invent ingenious ways of irritating his allies. You don't have to be one of the 51% of the electorate who voted against George Bush to worry about his ability to cope with such a momentous crisis. Yet, as the days pass, such a worry increasingly looks unfair.

Mr Bush, as even his friends admit, got off to a slightly slow start. His failure to return to Washington until the evening of the assault seems to have been the decision of his security handlers. The debate still rumbles on about whether it would have been irresponsible to fly the president back to a capital under attack. But Mr Bush's entourage made things worse by focusing so much energy on justifying the president's absence from the capital, as if public relations were what really mattered. “It was not our best moment,” one administration official now concedes.

But, since then, the president has grown before the nation's eyes, as he has consoled the bereaved and calmed the fearful. He has relied less on prepared scripts, rediscovered his voice, and regained his confidence. He has not been afraid to show his emotions: one day he was on the verge of tears when talking informally to reporters. But he has also projected a sense that he has the inner steel to fight a new kind of war. His address at the National Cathedral on September 14th, to an audience of the great and the good, was purposeful. But the real turning point came later that day when he went to see the rescue workers in New York. He stood on a pile of rubble, his arm draped around a retired firefighter. Someone handed him a bull-horn and he began to address the crowd. “We can't hear you,” shouted some members of the audience. “We can hear you,” Mr Bush replied. It was a moment that summed up, with simple eloquence, the nation's gratitude to these men and women.

Mr Bush's approval ratings have soared to almost 90%, a level reached in the past 50 years only by his father and Harry Truman. It is easy to explain this away. All America wants him to succeed. The Democrats have thrown their full support behind the president. To be sure, his performance is still far from flawless. Talk of “whipping terrorists” may sound Reaganesque at home, but overseas it seems too close to a cowboy film. It is naive to pledge yourself to ridding the world of “evil-doers”. And it is downright idiotic to describe the war against Osama bin Laden as a “crusade”. The last thing the West wants to do is to turn this into a religious war.

Yet even these slip-ups help to strengthen the tentative conclusion that Mr Bush is the right man for the moment. His natural diffidence and his verbal dyslexia make his new willingness to step up to the podium all the more impressive. Mr Bush was the perfect embodiment of the carefree America that died on September 11th 2001: an America which thought little about abroad, which was awash with easy money, and which saw no reason why you couldn't both cut taxes and increase social spending. People are warming to Mr Bush in part because his struggle to adjust to a new world is also America's struggle.

Public opinion is a notoriously fickle thing: his father saw his sky-high public opinion ratings fall to earth in the 1992 election. The real question remains whether Mr Bush has the staying-power to co-ordinate a full-scale war against terrorism: a war that may last for years, and will have to be fought on many fronts, economic and ideological as much as military. Mr Bush's father was able to mobilise the world behind

Desert Storm because he could draw on a lifetime of experience and contacts in foreign affairs. Mr Bush has no such hinterland to call on.

Comes the hour, comes, eventually, the man

Two things give cause for hope. The first is that, so far, the Bush administration has got all the big things right. It recognised immediately that America is involved in a new sort of war that will demand sustained effort and not just a spectacular display of firepower. It recognised that the war is also against the people who harbour terrorists, not just the terrorists themselves. Mr Bush is already preparing public opinion for the consequent inevitability of further American casualties.

The president has also surrounded himself with one of the most impressive foreign-policy teams in living memory. Dick Cheney and Colin Powell have both got first-hand experience of running a war, Mr Cheney as defence secretary during Desert Storm, Mr Powell as chairman of the joint chiefs of staff. Mr Powell has also got his hands dirty in combat. Mr Bush's team has complementary skills. Mr Cheney, now being nicknamed “the war minister” by Washingtonians, is doing much of the detailed planning. Mr Powell, the most multilateralist member of the cabinet, is building relations with the allies.

It will not be easy to keep these different voices singing from the same sheet. These are very early days. And terrorism is the most elusive target imaginable. But it is worth bearing in mind the comparison between George Bush and another accidental president, Harry Truman.

Few people thought, in 1945, that this foreign-policy virgin had a chance of filling FDR's shoes. “If Harry Truman can be president, so could my next-door neighbour,” was one of the more polite judgments. At first, Truman was almost paralysed by the immensity of his task and the paucity of his experience. But this inarticulate haberdasher from the heartland became the architect of the Marshall Plan, NATO and the Truman doctrine. He had the grit to use the atomic bomb, the imagination to grasp the nature of the emerging cold war, and the simple eloquence needed to explain the strange new world to the Americans. Has Mr Bush the same hidden resources? It is no exaggeration to say that the future shape of the world hangs on the answer.

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Canada and the United States

Setting a new perimeter

Sep 20th 2001 | OTTAWA
From The Economist print edition

AP

The United States' response to terrorism has particular implications for its neighbours. Canada faces calls to harmonise its security policies, while Mexico is feeling ambivalent

OTHER countries may claim a special relationship with the United States, but no country is more intimately bound to it than Canada. The two share a 6,400km (4,000-mile) transcontinental border and the world's largest bilateral trade flow, worth C$627 billion ($422 billion) last year. So Canadians have quickly realised that the aftermath of the terrorist attacks in the United States will change their country too.

The impact was immediate: 250 flights were diverted from American to Canadian airports last week, and some 30,000 airline passengers were stranded for three days. They were well looked after. At Halifax, in Nova Scotia, the Canadian Red Cross quickly organised bedding and meals, as well as toys and clothes, for 10,000 with cheerful efficiency, according to one passenger. Air traffic within Canada was cancelled, too, while the abrupt tightening by the American authorities of controls at border crossings delayed road transport, so much so that car-assembly plants closed for several days in each country for lack of parts.

Revulsion at the attacks has been widespread, and not only because up to 60 Canadians died. On September 14th a crowd of about 100,000 turned out to honour the victims—the largest gathering ever known on Ottawa's Parliament Hill. “You are truly our closest friends,” said Paul Celucci, the American ambassador.

Even so, Canada now faces some difficult questions. The first is whether to erect what some have called “a perimeter wall” round North America, by harmonising immigration, security and customs-clearance systems. Canada must be inside any such “wall” round the United States because 87% of its exports go there, says John Manley, Canada's foreign minister.

Contrary to early reports, it appears that none of the 19 hijackers entered the United States from Canada, though a man who later arrived in Toronto was turned over to the FBI as a suspect. Yet Canada has acquired a reputation as a terrorist haven. A large Tamil population in Toronto legally raises funds for terrorist insurgents in Sri Lanka. A group of Sikhs from Vancouver has been charged with blowing up an Air India jumbo jet, killing 329 passengers, in 1985. The most worrying recent case concerns Ahmed Ressam, an Algerian who was arrested in December 1999 when trying to enter the United States, apparently in order to blow up Los Angeles airport. Though twice refused refugee status, he carried a (phoney) Canadian passport. His arrest uncovered a Montreal cell.

Such cases have brought calls for changes in Canada's traditionally liberal immigration policy; about 200,000 people are admitted each year. A new bill, which is close to approval, tightens the rules for refugees, requiring stricter security checks, granting authorities more discretion to detain people at the

border, and restricting appeals against deportation. The government is already taking a sterner line against illegal immigrants; last year it deported some 8,900 people.

In a parliamentary debate on September 17th, Jean Chrétien, the prime minister, made it clear that he would not close Canada's doors. “We will continue to offer a refuge to the persecuted,” he said. And he denounced as “unacceptable” several threats and assaults on Canadian Muslims. But the pressure to integrate further with the United States is strong. Mr Celucci was talking of a common immigration policy even before September 11th. The Fraser Institute, a conservative think-tank in Vancouver, has called for a customs union.

Uncharitable terrorists

The more pressing issue facing Canada is not immigration but internal security. Another bill, to lift the charitable status of any group found to be supporting terrorism, is now likely to win swift approval in Parliament—despite objections by human-rights lawyers that it leaves the definition of “terrorism” to official discretion. Stockwell Day, the leader of the conservative opposition, called in the parliamentary debate for a comprehensive anti-terrorism law, similar to those in Britain and the United States. The Liberal government is wary of such legislation, especially since Canada's Supreme Court has given a broad interpretation to the country's 1982 Charter of Rights and Freedoms.

The third question for Mr Chrétien is whether, or how far, Canada should join the United States in military action abroad. The prime minister is to meet President George Bush early next week “to co-ordinate our actions”. The government seems prepared to send forces—but it has few at its disposal, partly because some are already in Bosnia, Kosovo and Macedonia. Though its defence plans call for a brigade-size force of 5,000 men to be permanently available for deployment, only about 1,200 troops (with no transport) could now be mustered, says one military pundit. More useful might be Canada's squadrons of F-18 fighter jets and a small special-forces unit.

The United States has long complained that Canada spends too little on defence (just 1.2% of GDP, half the average figure for its NATO partners). Mr Chrétien's government is now expanding the 59,000-strong armed forces. He has promised to go “every step of the way” with the United States in its “war” on terrorism. That may mean taking some tough decisions he has so far ducked, such as whether to back Mr Bush's missile-defence plan, as well as a “perimeter wall”.

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About sponsorship

Mexico and the United States

Fair-weather friends?

Sep 20th 2001 | MEXICO CITY
From The Economist print edition

Heading for the sidelines

A WEEK before the terrorist attacks, Mexico and the United States were the biggest of buddies. On a four-day state visit, President Vicente Fox played basketball with George Bush. Amid effusive pledges of friendship, Mr Bush made promising, if cautious, statements on migration and the drug war, the two top issues on the bilateral agenda. “The United States has no more important relationship in the world than our relationship with Mexico,” he said. He recalled that in 1861, Abraham Lincoln had “paused in the darkest hour of this country's history to send a word of hope to Mexico”.

Now, as the United States faces another dark hour, Mr Fox said that Mr Bush had made a point of calling last weekend to say that he had not forgotten his commitments. Even so, Mexico fears relegation to the junior league of American foreign policy. It will not be alone in that, but few will feel it so hard. Canada apart, the United States' main allies for the fight to come will be in Europe, the Middle East, perhaps Asia, but not Latin America. America's heightened suspicion of foreigners may dash Mexican dreams of guest-worker programmes and migrant amnesties. Moreover, tighter border security and the blow to the American economy, which takes 89% of Mexico's exports, will both hurt the country's trade.

How much so is unclear. For the forseeable future, American customs officers are at “Level 1” alert. That means checking every single vehicle crossing the border. At the busiest crossings, cars face a queue of up to four hours. Delays for trucks are shorter. So far, truck traffic has not fallen, says Carlos Benavides, the director of Camino Colombia, a toll road in Laredo, Texas. “But that's because what's going through now was already paid for. We'll have to see what happens in the next week or two.”

The government has put a brave face on its disappointment. Officials have been anxious to show solidarity with the United States and push their ambition for Mexico to win one of the rotating seats on the United Nations Security Council this year. “The United States has every right and reason to seek revenge—we cannot deny them support,” said Jorge Castañeda, the foreign minister, a former left-winger.

But for all this talk, many Americans living in Mexico wonder aloud why the country has held no official memorial ceremony or mass vigils, as Canada and some European countries have. Mexicans—notably well-educated, well-off ones—answer that question bluntly. “It isn't our fight,”“They had it coming for all the things they've done to the rest of the world,” and “Now they know what a real disaster feels like,” are commonly expressed sentiments. Mund, a polling firm, surveyed 435 Internet users—a group “not representative of the general population,” points out Daniel Lund, Mund's director—and found that only 22% would support sending troops to back a military reprisal, though another 31% would send aid.

Anti-Americanism in Mexico has deep historical roots, stemming from the loss of half of its territory to its northern neighbour's “manifest destiny” in the mid-19th century. NAFTA, and migration to the United States, have recently softened such opinions. Most Mexicans now have a favourable view of their neighbour, according to earlier polls. But resentment endures, especially among the political elite.

The same goes for the rest of Latin America, which has often felt bullied by the *Yanquis*. Although perhaps 70 Salvadoreans died in the New York attacks (along with maybe 19 Mexicans, and about 110 other Latin Americans), in El Salvador there were protests when the government cancelled independence day parades due for September 15th. In fact, nowhere in the developing world, where wars and natural disasters frequently kill thousands almost unnoticed elsewhere, have there been the outpourings of sympathy seen in Europe.

In Latin America, that may also be because people do not feel themselves to be a target. But Colombia,

which has suffered its own terrorism, wants a regional “crusade” against it. Mexicans might yet conclude that if they want the United States to be more than a fair-weather friend, they will have to reciprocate.

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Argentina's economy

Zeroing in

Sep 20th 2001 | BUENOS AIRES
From The Economist print edition

Turning spending cuts into reforms

IN JULY, when Argentina discovered it had exhausted investors' confidence and thus its access to credit, President Fernando de la Rua's government boldly adopted a plan to eliminate the country's fiscal deficit at a stroke. On the strength of that policy, it has gained an $8 billion emergency loan from the IMF this month. Now it must wrestle with the implications of “zero deficit”. None is easy.

Domingo Cavallo, the economy minister, has already slashed up to 13% from civil servants' wages and pensions, and from payments to suppliers. Balancing the books requires trimming spending by a further $1 billion by December. Next year total government spending will fall by $6.5 billion (or around 10%) compared with this year, according to a draft budget released last week. The cuts could be more drastic still: the budget assumes economic growth of 6% next year. That was heroically optimistic even without the impact of the terrorist attacks on emerging-market finance (see article). No end is yet in sight to a recession now in its fourth year. Every percentage point by which the economy undershoots its growth target reduces tax revenues by around $500m.

With an important congressional election next month, the government omitted vote-losing details from the budget. But it admits that the wage and pension cuts will continue if growth falls below target. Savings should also come from interest payments on debt, down by $2.7 billion on this year. Some $1.2 billion of this results from a debt swap in June; the rest is supposed to come from a new debt-restructuring deal backed by the IMF. Since interest payments now account for a fifth of total federal spending (see chart), any such deal will be “unavoidable but insufficient”, according to Ricardo Fuente of Ecolatina, an economic think-tank.

The budget also foresees cuts of up to $3 billion in revenue transfers from the centre to the provinces. But these may depend on Mr de la Rua gaining approval for a politically tricky constitutional reform, which the government promised the IMF it would send to Congress by November.

Cutting welfare spending is no more politically attractive. Almost two-fifths of total federal spending is accounted for by the social-security administration, the main state pensions and welfare body, whose budget this year is $23 billion. Its director, Douglas Lyall, reckons he can squeeze up to $800m a year from efficiency savings. Similar claims have been made before. But this time they will be met, he says.

Planned savings include $100m from renegotiating “excessive” bank charges and an administrative shake-up, including a clean-out of political appointees. Another $250m is being trimmed from pension schemes originally set up by the provinces, at least a tenth of whose pension claims are fraudulent, says Mr Lyall. (In La Rioja, the small home province of Carlos Menem, Argentina's former president, 148 “pensioners” are being investigated for fraud.) Another $350m will come from ending fraud in subsidies to poor families. But Mr Lyall concedes that more cuts are likely, meaning reductions for genuine claimants. In fact, a rising proportion of Argentines work in the informal sector, and have no pension arrangements.

Besides the main social-security fund, Argentina has an expensive mish-mash of health and welfare schemes, riddled with duplication and fraud. A proposal to replace these with a single agency has failed to overcome entrenched political resistance. The supposedly autonomous pensioners' health agency

(known as PAMI) is another drain for government funds. It has been chronically mismanaged, serving both the main political parties as a slushfund. Other sensitive targets include public universities ($1.8 billion), a $660m fund to bolster teachers' wages and some fiercely defended special interests: a fund for La Rioja ($145m), another for tobacco production ($180m), and fuel subsidies in Patagonia ($100m).

Touching any of this will be hard, even if the government survives the pasting it is likely to receive in next month's elections. Still, most economists agree that, provided it can stick to its “zero deficit”, it will probably not need to raise more money until the second half of next year. Its progress in cutting spending will be closely watched by the IMF as well as by investors. But even if it succeeds, it will merely postpone, not end, the risk of a debt default—unless and until the economy starts growing again.

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Panama

Becalmed

Sep 20th 2001 | PANAMA CITY
From The Economist print edition

Missing economic opportunities

EPA

In Colon, they think the government's a load of rubbish

IN DECEMBER 1999, when the United States pulled out its last troops and handed control of the Panama Canal to Panama's government, alarmists foresaw disasters ranging from shipping chaos to an invasion by Colombian guerrillas. Optimists predicted a new era of growth for a small but strategically placed country, blessed with good infrastructure and lots of investment possibilities. The alarms have proved false, but so have the hopes.

Plans to develop the formerly American-owned canal zone have stalled. Shippers grumble that more than three years after the Panama Maritime Authority was created to define a strategy for their industry, there is still no strategy. Discontent is growing as the economy slows. Riots over bus fares have been followed by disturbances this week in Colon, the second city, where crime and poverty are rife.

Much of the frustration is directed at President Mireya Moscoso, who took office two years ago promising increased social spending and a more cautious approach to economic liberalisation. Her government has suspended planned privatisations and raised some agricultural import tariffs. It has also faced unexpected difficulties. Government revenues from the canal were up by 46% in 2000 compared with the previous year, after a change in its status from that of a non-profit American federal agency to a privatised business. But revenue from other taxes has fallen sharply. The government is heading for a fiscal deficit of up to 1.5% of GDP this year, after balancing its budget in 2000.

The economic slowdown is not Mrs Moscoso's fault. The departure of hundreds of big-spending American canal staff, the world economy, high oil prices and low banana and coffee prices have all taken their toll. But critics such as Guillermo Chapman, a former economy minister, argue that Mrs Moscoso “has taken a long time to recognise that this slowdown is happening and hasn't come up with an effective programme to face it.”

Coming on top of a nagging series of corruption scandals, this has undermined Mrs Moscoso's popularity and political fortunes. Last year two parties from her coalition defected to the opposition. They are now refusing to pass a much-needed tax reform until the government sets out its economic plans, cuts spending and cracks down on tax evasion and corruption.

Nor did Mrs Moscoso help herself by appointing many young and inexperienced new officials. The Interoceanic Region Authority, which is responsible for canal-zone development, had several projects ready to start, including the redevelopment of Howard air-force base. But after Nicolas Ardito-Barletta, the authority's director, resigned over a dispute with the president, his plans were put on ice. So Panama has not taken advantage of some unusual opportunities.

The government says it will spend more on promoting tourism. It will soon abolish a $1 tax on international telephone calls. That might attract call centres to the country, since it has good fibre-optic connections. And when the Financial Action Task Force, a rich-country watchdog, placed Panama on its money-laundering blacklist last year, the government passed new laws that tighten financial controls and got the country removed from the list this year. Panama's banking authorities are now advising counterparts in Costa Rica, Guatemala and Russia. The government can move fast when it wants to. A

pity it doesn't want to more often.

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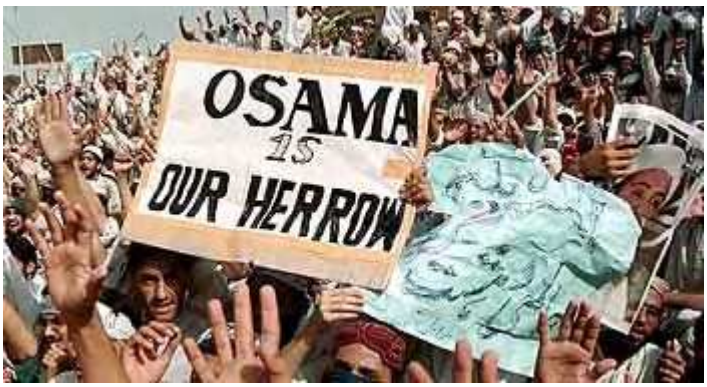
About sponsorship

Pakistan and the United States

Caught in the middle

Sep 20th 2001 | ISLAMABAD
From The Economist print edition

Reuters



The impending American assault on Afghanistan is fraught with danger for its neighbour. But it may also offer an opportunity

Get article background

THESE are nervous days in Pakistan. “If America attacks Afghanistan, people will come on to the streets and a civil war will start,” predicts Muhammad Rashid Khan, who sells digital video disks in Rawalpindi's Hathe Bazaar. Whether or not Mr Khan is right, an American-led war on terrorism could transform Pakistan, as well as the dynamics of its nuclear-tipped confrontation with India.

The country's self-appointed president, Pervez Musharraf, has little choice but to go along with American plans to punish Afghanistan unless it extradites the accused terrorist, Osama bin Laden. He fears that Pakistan's aid-dependent economy, its ability to stand up to India, even its nuclear installations, could be put at risk by American wrath. “Bad results”, he told Pakistanis in a televised speech on September 19th, “could put in danger our territorial integrity and our solidarity.”

On the more positive side, though, there may be much for a compliant Pakistan to gain, including perhaps a partial write-off of its $37 billion external debt and an adjustment to the recent American tilt towards India. It could even be, the wily General Musharraf may be dreaming, a reprise of cold-war days, when an indulgent United States backed up Pakistan for the sake of defeating a common enemy in Afghanistan. If the Taliban fall, Pakistan is expecting a large say in whatever order succeeds them.

Could be, but with dangerous differences, as General Musharraf well knows. The prospective enemy this time is not a godless Soviet-backed regime but an emphatically Islamic one that Pakistan itself has carefully nurtured as a way of furthering twin policies: clout in Central Asia and pressure on India to settle the dispute over Kashmir, a Muslim-majority state divided between the two countries. Barring an unlikely agreement by Afghanistan's Taliban government to hand over Mr bin Laden and his associates, Pakistan has offered intelligence, air space and perhaps, if the president is feeling brave enough, it may provide ground facilities such as airports for an attack on the terrorists and the government that harbours them.

The Taliban have vowed to wage war against any country that joins the attack and are said to have placed anti-aircraft guns along the border with Pakistan. This, though, looks the least of Pakistan's worries. The Afghan army is little threat to one as big and well-equipped as Pakistan's.

Facing blowback

The greater fear is what people in the region call “blowback”. The war to liberate Afghanistan from the Soviet Union in the 1980s flushed refugees by the million and armed zealots in their tens of thousands into Pakistan. It now faces another such influx (thousands of refugees have already come, and many more are at the border), perhaps with more explosive consequences. The target regime shares Pakistan's religion and the Pathan ethnicity of 15% of its population. So far religious groups have taken the lead in protesting at the prospect of American action. At one rally in Islamabad on September 17th, demonstrators wrapped in white shrouds to signify their willingness to die for Islam heard speakers proclaim that “friends of the US are traitors to Pakistan”.

Such carefully-policed gatherings of hundreds help the government, up to a point, by dramatising the risks it runs on behalf of the anti-terror coalition. But if many Afghans were to die in an American-led reprisal, the protests could turn into riots as thousands of ordinary Pakistanis joined the cause, egged on, no doubt, by the various mafias that profit from their dealings with the Taliban. General Musharraf's government, many speculate, might not survive. And the more help he offers the Americans, the greater the outrage he will have to contain. The general tried to pre-empt some of that outrage in his television speech by justifying the alliance as a blow against a bigger enemy, India. The Prophet Muhammad, he said, would have chosen the same course.

Pakistan could emerge from a showdown with the religious right as a more liberal society and, perhaps, a more authoritarian polity at the same time. Since taking power in October 1999, General Musharraf has tried to tame the groups that preach Islam in its least tolerant form and sometimes kill members of sects that disagree with them. But he has been hesitant in pursuing such policies as the disarming of extremists. “Now the state may have to have a direct confrontation,” says Shireen Mazari, director of Pakistan's Institute of Strategic Studies. One casualty of a tougher line could be the “road map” to democracy, which ordains the holding of elections by next October. In the circumstances, the United States might not object too loudly.

The Kashmir connection

Could General Musharraf engineer a coup of a different sort in relations with India? At first sight, the crisis plays into his hands. Pakistan has long tried to draw attention to Kashmir, portraying the dispute, correctly, as a “nuclear flashpoint”. Now that the strikes against America have highlighted Muslim discontent, this ought to be easier. Part of its reward for joining the anti-terror coalition, Pakistan hopes, will be American help in forcing India to negotiate seriously over Kashmir.

This could be optimistic. India, too, will be a coalition member, though presumably a less valuable one since it has no border with Afghanistan. More worrying for Pakistan, the outrages in America pile additional discredit on its political and probable military support for the mujahideen who cross into India's side of Kashmir from bases in the Pakistani portion. Their targets are not just Indian soldiers; they are the likeliest suspects in frequent massacres of non-Muslim civilians.

Many of these groups train their fighters in Afghanistan. General Musharraf insists that their activities are not terrorist, but the distinction may collapse in American attacks on mujahideen installations in Afghanistan. The Indians will point to the camps in Pakistani-controlled Kashmir. Unless they are closed, those Indians who advocate “hot pursuit” of militants across the de facto border will no doubt press their case more strongly than ever.

There is thus a danger that the American-led war on terror will merely entrench south Asians in their earlier positions. But there is still a chance of a better outcome, if the fanatics are defeated and the moderate majority is shocked into compromise. This could be a defining moment indeed.

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Afghanistan

Honoured guest

Sep 20th 2001
From The Economist print edition

The Taliban show no signs of surrendering bin Laden

Get article background

BY THURSDAY, it looked unlikely that the Taliban would be ready to hand over Osama bin Laden, whom they have sheltered since they took power in Afghanistan in 1996. The offer by Mullah Muhammad Omar, their reclusive one-eyed leader, for Mr bin Laden's case to be decided by a panel of clerics from any three Islamic countries has been made before—and rejected by the Americans in no uncertain terms. An Islamic conclave advised the Taliban government to persuade him to leave voluntarily. But this stops well short of America's demands—and is not likely to be taken too seriously by the Afghan leadership.

This may on the face of it seem to be a baffling miscalculation by the Taliban of their own best interests. Not only is the downside—American military action against their country—dreadful to contemplate, but the benefits that would flow from handing over the wanted man would be impressive too. They might include the lifting of crippling sanctions, the possibility of investment (American oil companies have been keen to run pipelines from the Caspian to the Arabian Sea through Afghanistan) and a sharp increase in much-needed aid. Until a year or so ago, the Taliban were eagerly seeking diplomatic recognition and better relations with the West. To help get them, they destroyed their country's opium crop, slashing global production of heroin in half.

Their bid for diplomatic respectability came to nothing, for a simple reason. America made it clear that the price was the handover of Mr bin Laden, whom it wanted at that time for the deadly attacks on two American embassies in Africa in 1998. When the Taliban refused to surrender him, America pushed for, and got, last December, the imposition of tough UN sanctions on Afghanistan. The Taliban's relations with the outside world have been much more hostile since then.

Mr bin Laden, in other words, is apparently non-negotiable. And the reason is that he and the Arab soldiers he commands are a powerful force inside Afghanistan in their own right, his money and men constituting an important element in the Taliban's ability to squeeze their enemies, the Northern Alliance,

into an ever-smaller wedge of territory in the north-east. A graphic example was provided two weeks ago when two Arab journalists blew up Ahmad Shah Masoud, the commander of the Northern Alliance's forces, along with themselves. It seems probable that this assassination was carried out by Mr bin Laden's men. So powerful have the Arab fighters in Afghanistan become that ordinary Afghans have been heard to complain that it is they, not the Taliban, who really control the country.

Discontent, however, is something that the American-led coalition may be able to work with. The Taliban are mainly Pashtu-speakers from the country's south and east. The ethnic Uzbeks, Tajiks and Hazaras of the north and west resent their hegemony. For everyone, the Taliban's social strictures have become more onerous, while the initial delight at their restoration of law and order is fading. Several protests broke out over the summer. They followed the series of bombs that have exploded outside Taliban offices over the past few years; one destroyed Mullah Omar's home in Kandahar. But translating all this into the overthrow of the Taliban will be an uphill struggle.

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Japan and the United States

On board?

Sep 20th 2001 | TOKYO
From The Economist print edition

Junichiro Koizumi wobbles over military help

AP

THE prime minister, Junichiro Koizumi, at first sounded reassuring. Japan, he said, stands firmly beside the United States in the wake of the attacks in New York and Washington. All too soon, however, Mr Koizumi began to look anything but firm. Direct participation by Japanese forces in any American-led military response, Mr Koizumi soon made clear, would be impossible. Even his suggestion that Japan should provide “rear area” help with supplies and logistics quickly sank into the morass of consensus decision-making.

A hurried, late-night press conference on September 19th was supposed to set the record straight. Along with aid for refugees and financial help for Pakistan and India, Mr Koizumi took the first big gamble of his five-month administration and promised controversial logistical support as well. Now, he must deliver.

Mr Koizumi is desperate to do whatever he can to show support for the United States, whose warmth towards Japan had already cooled amid signs that Japan's resolve to introduce urgent financial reforms was fading. Japan also fears another debacle like that of 1991, when it dithered about its contribution to the allies in the Gulf war, sent a huge cheque instead of people, and got no thanks in return.

A security treaty, signed in 1960, obliges America to defend Japan from attack. But Japan's war-renouncing constitution, drafted with American help in 1947, makes any show of military reciprocity fraught with difficulties. Japan does maintain well-equipped armed forces, but on the basis that these forces are for self-defence only. The suffering inflicted by Japan on its neighbours during the second world war makes any suggestion of an international role for Japanese troops controversial, no matter how slight that role may seem to foreigners outside Asia.

The United States has been pressing Japan to interpret its constitution to allow its forces to come to its ally's defence. In 1999 the government approved guidelines allowing the “self-defence” forces to provide logistical support for the Americans in an emergency “in areas surrounding Japan”. Gen Nakatani, the young turk whom Mr Koizumi has put in charge of the Defence Agency, believes the government could work within these guidelines, even if the theatre of war were Afghanistan.

But older heads are counselling caution. Yasuo Fukuda, the chief cabinet secretary, sometimes called the real power behind Mr Koizumi's administration, says that treating Afghanistan as a neighbouring country would be too big a stretch. So a new set of guidelines may be needed, though the government has not yet stated whether it will legislate for these or not.

Mr Koizumi faces powerful opponents of new legislation within his own party. His main coalition partner, New Komeito, has a strong pacifist complexion. Some small opposition parties, such as the Social Democrats and the Communists, implacably oppose any expansion of the armed forces' role. Yet there is almost certainly a large majority in parliament available to Mr Koizumi should he press ahead. The real question, like the one that hovers over Mr Koizumi's financial reforms, is whether he can abandon the traditional consensus system and show leadership.

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The Koreas and the United States

Support of a sort

Sep 20th 2001 | SEOUL
From The Economist print edition

The North gives less than warm support to America—not surprisingly

AFTER refusing official contacts with South Korea since March for no obvious reason except annoyance with America's new president, George Bush, North Korea abruptly changed its mind and the two sides met this week. The South had hoped that at the conclusion of the talks on September 18th the two countries would make a joint declaration denouncing terrorism. But the North apparently said no. The United States will have to make do with the strong support offered by the South's president, Kim Dae Jung, after the attacks in New York and Washington. The North separately condemned the attacks, but almost in the same breath condemned the United States for its “ambition for world domination”.

Despite the North's emergence from isolation by establishing diplomatic ties with capitalist countries, it remains on America's list of states that sponsor terrorism. The North is believed to have sold arms and missiles to several countries, among them Iran and Pakistan. South Koreans fervently hope that the North has nothing to do with the American atrocities; any involvement would have a devastating effect on the warming relations between the two countries.

At this week's talks the two sides agreed to another set of reunions next month of families separated since the Korean war of 1950-53. The officials will meet again in October (if the North's communist rulers do not change their mind at the last minute, as they often have done in the past) to discuss ways to reconnect a railway across the border. The Korean line might eventually be linked to the Trans-Siberian railway. The Korean teams also have in mind a cross-border land route for southern tourists travelling to Mount Kumgang in the North, as well as research to control floods and a plan to open both countries' territorial waters to commercial vessels.

But peaceful co-operation on the Korean peninsula, which has been divided for more than half a century, seems a long way off. The border remains sealed and ordinary people have no mail or telephone links. The North is convinced that it is better to receive than to give. Suffering from a shortage of electricity, for instance, the North continues to ask to be linked to the South's grid. That would require a nod from the United States, the South's close ally. But the Americans may not at the moment be in a co-operative mood.

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Israel and the Palestinians

Stop, says the superpower

Sep 20th 2001 | JERUSALEM
From The Economist print edition

Israel and the Palestinians are groping towards a fragile truce

EPA

STRANGE are the uses of adversity. In a single week of intensive diplomacy after the terror attacks in Washington and New York, America seemed to have pushed Israel and the Palestinians into a ceasefire in the West Bank and Gaza. On September 18th Yasser Arafat called on the Palestinians to stop shooting, even in their own defence. In return, Ariel Sharon, Israel's prime minister, ordered his army to stop offensive actions against the Palestinians and pull back from its advanced positions. This might, said Shimon Peres, Israel's indefatigable foreign minister, be a “turning-point”.

Perhaps. But even if the ceasefire holds, the fact is that there has been no meeting of minds between Mr Sharon and Mr Arafat. Rather, each has been made to understand that neither can afford to cross the United States in its hour of need and peril. America intends to build the widest possible coalition before launching its counter-strike against terrorism. The unequal struggle in the Palestinian territories, televised daily around the Arab world, makes it harder for Muslim countries to join an alliance led by Israel's chief ally. *Ergo*, that fighting must end.

This is a tactical setback for Mr Sharon. He had hoped that the attack on America would unite Israel and America against Islamic terrorism, and bring home to Americans the suffering of Israeli civilians at the hands of Palestinian suicide bombers. Calling Mr Arafat Israel's Osama bin Laden, Mr Sharon had cancelled a meeting between Mr Arafat and Mr Peres, on the ground that such a meeting at such a time would bestow legitimacy on a terrorist.

The Americans, it seemed, were having none of this. At midweek, the Arafat-Peres meeting seemed poised to go ahead, provided—in deference to Mr Sharon—that there were first at least 48 hours of calm on the ground. The killing of an Israeli woman in a “drive-by” shooting near a settlement south of Jerusalem on September 20th seemed by itself unlikely to disturb progress. Meanwhile, Colin Powell, America's secretary of state, had swiftly dismissed the possibility of Israeli forces joining any military action that the Americans might be planning.

For Mr Arafat, the American-imposed truce may be an opportunity. His difficulty since the *intifada* began has lain in working out how to end it without having any diplomatic gain to show for the loss of some 600 Palestinian lives. The Israelis are still intent on giving him none: hence their refusal to negotiate “under fire”. With the pattern of Middle Eastern alliances suddenly shifting, Mr Arafat can now try to persuade his people that it is time to show they are on America's side. This will not be easy, given that many of them plainly are not. Hamas and Islamic Jihad, the groups that have specialised in suicide attacks against Israelis, may react with redoubled fury if they perceive America's coalition to be directed against the militant Islamism to which they subscribe themselves.

What, though, if a ceasefire were to take hold? The two sides could then move on to implement the provisions of the Mitchell Commission's report, compiled earlier this year. The report calls for military redeployment, a settlement freeze, the lifting of closures and other restrictions on civilian life in the Palestinian territories and, above all, for resumed peace talks. Just to get that far would be a minor miracle. Mr Sharon is strongly attached to the West Bank settlers and so opposes a settlement freeze. And even if serious peace talks did resume, their chances of success would be remote.

And next?

The little common ground that seemed to exist at last year's Camp David summit, when Ehud Barak was Israel's prime minister, has been washed away by a year of recrimination and bloodshed. Mr Sharon has made no secret of his belief that Mr Barak's negotiations with the Palestinians went too far, and that they must eventually be made to settle for far less than they were offered by his predecessor. Many Israelis who supported Mr Barak have grown hawkish as a result of the Palestinians' bloody *intifada*. Given that the Palestinian negotiators rejected as inadequate the very terms that Mr Sharon views as too generous, there seems little prospect, under their present leaders, of the two sides reaching an early peace deal.

From the Bush administration's point of view, all of this is now a problem for the medium-to-distant future. What matters for the present is to soothe the sore of Palestine while Arabs elsewhere are coaxed into Mr Bush's grand alliance against terrorism. This is chastening for Israel. In the Gulf war, the last time the Americans asked them to keep their heads down and exude sweet reason, their reward was to be bombarded in their cities by Saddam Hussein's Scud missiles.

Even if Israel is spared, this time, the frustration of being hit and not being allowed to hit back, it is likely to face the intensely uncomfortable situation of being frozen out of the evolving international coalition of what President George Bush himself calls “good against evil”, while its enemies, among them states that have long trysted with terror, are assiduously wooed by the Americans.

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Iran and the United States

The enemy of my enemy

Sep 20th 2001 | TEHRAN
From The Economist print edition

A shared distaste for the Taliban

EPA

It's better than Kabul

BACK in 1991 Iran stood and watched as America, a distant foe, defeated Iraq, a neighbour, in the Gulf war. A decade on, as America squares up to another neighbour, the Taliban of Afghanistan, it is a bit different: Iran's leaders are far from being of one mind. President Muhammad Khatami and his reformist supporters would like to use the episode to get closer to America, while the establishment around Ayatollah Khamenei, the supreme leader, is determined to stop them. Both sides, however, are united in their desire to have a say in Afghanistan's political future, and both are anxious to prevent an influx of Afghan refugees: Iran already plays host to about 2m of them.

At first, reformists and conservatives reacted to the attacks on American civilians with unexpected cohesion. The president's prompt message of condolence did not come as a surprise. More noteworthy was the sympathy offered by the same hardline clerics whose Friday sermons are so often accompanied by chants of “Death to America!” According to Colin Powell, the American secretary of state, such “signals” were “worth exploring”. Meanwhile, Mr Khatami reassured Kofi Annan, the UN secretary-general, that terrorism was a “shared problem”.

The back-slapping was too anomalous to last. Earlier this year America's State Department designated Iran the world's “most active state-sponsor of terrorism in 2000”. In June a United States federal jury found that Iran had “directed” the murder, in 1996, of 19 American marines in Saudi Arabia. For their part, Iranians of all hues accuse America of supporting a terrorist state, Israel.

On September 16th a State Department official said that Iran's help in a campaign against terrorism would be welcomed only if it withdrew support from Hizbullah—hardly a realistic demand, not least because few countries, apart from America and Israel, consider Hizbullah to be a terrorist organisation. The next day Mr Khamenei waded in to bolster anti-Americanism in Iran. He attributed the attacks to America's policy in the Middle East and claimed to have detected “signs of Zionist direction and planning” in the mayhem.

In spite of all this, it is still possible that Switzerland's ambassador in Tehran, who looks after America's interests there, will bear encouraging messages when he meets officials in Washington in the next few days. Afghanistan is the only subject on which Iran and America co-operate diplomatically. The Iranians' dislike for the Taliban is only a few notches short of that felt in America. It is an open secret that Iran supplies arms and training to the Northern Alliance, a loose anti-Taliban coalition. As a Shia Muslim theocracy, Iran projects itself as the protector of Afghanistan's Shia minority, who have been cruelly oppressed by the Sunni Taliban.

The ceasefire called by Yasser Arafat this week may have increased, slightly, the chances of co-operation between the United States and Iran—but not if America expects Iran to abandon long-held positions about the Palestinians, or appears to disregard its fears of a fresh flood of refugees. There would be strict limits to such co-operation. But deploying an extra division or two on the Afghan border to coincide with an American attack would prove an unwelcome distraction for the Taliban.

So, indeed, would allowing Afghan opposition groups based in Iran to raise, as they have requested, an irregular army made up of refugees to march across the border. According to Yousef Vaezi, the Tehran representative of the Unity Party, a component of the Northern Alliance, a force like this might attract as

many as 100,000 volunteers. Such a scheme would please Iran's interior ministry, which has been trying for years to find ways to persuade Afghan refugees to go home.

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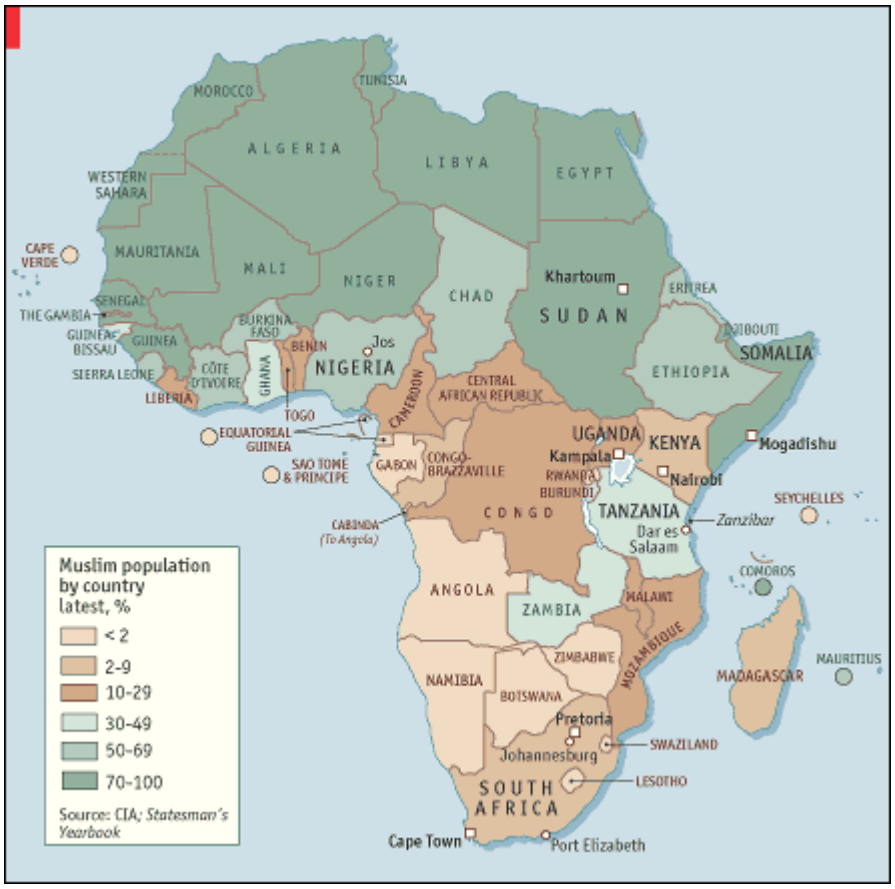
Muslims in Africa

Stoking fires

Sep 20th 2001 | JOHANNESBURG
From The Economist print edition

Some African governments are braced for an increase in religious tension

DON'T let retaliation against Muslim fanatics itself create a “fertile climate for terrorism”, pleaded South Africa's deputy foreign minister, Aziz Pahad, this week. Some African governments are already jittery that heedless talk of a “crusade” against Muslim enemies will stoke violent quarrels between Islamic groups and others at home. Hussein Solomon, of Pretoria University, reckons that there are 380m Muslims in the whole of Africa—more than in the Middle East. The Organisation of Islamic Conference, a grouping of Muslim countries, has 22 members from sub-Saharan Africa.



Of these, only Sudan seems a possible target for American strikes. America has no representation there, and it is one of seven countries listed as a sponsor of terrorism by the State Department. Osama bin Laden, chief suspect in last week's attacks, lived there until 1996, and Sudan has been under an American trade embargo since he left. Mr bin Laden was linked to the bombings in August 1998 of America's embassies in Kenya and Tanzania, which killed over 220 people, most of them Africans. In retaliation, the Americans bombed a factory in Khartoum, Sudan's capital, which, they said, produced chemical weapons. This week, however, the Sudanese government—which has recently been trying to distance itself from Islamic ideologues—was anxiously rushing to assure the world that it was “not connected with what happened in the United States”.

Mr bin Laden has also been linked, though the evidence is shaky, to the killing and humiliating of American peacekeepers in Somalia in 1993. The Americans and the UN were driven out and, since then, Somalia has become even more rigidly Islamic (see article).

American air strikes against Afghanistan and Sudan in 1998 were followed in parts of east and southern Africa by violent activity by Islamic groups. In South Africa Islamic militants called People Against Guns and Drugs (PAGAD) were thought to be behind a spate of bombings aimed at buildings in Cape Town which erupted in early 1999. Though PAGAD appears to be a spent force, reports of attacks on Muslim traders may stir its supporters into action again. A mob looted 25 shops and smashed up an Islamic centre in a Somali community near Port Elizabeth last week.

An Islamic rebel group is also behind a series of bomb explosions in Uganda's capital, Kampala, which have killed dozens of people since 1998. The Allied Democratic Forces (ADF), which also has non-Islamic supporters and is said to be backed by Sudan, conducts a vicious guerrilla war in western Uganda. The government seems to have it on the run but its tactics may threaten legitimate protest. An anti-terrorism bill published last week imposes the death penalty for any convicted terrorist and for anyone who backs terrorism. Some people fear the bill might be used against members of the opposition, who are already forbidden to form a political party.

There is similar concern in Tanzania, where the government may be using the threat of Islamic extremism for its own benefit. The only electoral challenge to the ruling party of President Benjamin Mkapa comes from mostly Muslim Zanzibar, where the authorities regularly invoke the threat of Islamic fundamentalism at polling time. After the general election last October, dozens were killed on Zanzibar by the security forces and hundreds fled to nearby Kenya.

In West Africa too, several countries have reason to fret over increased religious tension. Islam, which has been present there for centuries, is spreading, and many Muslims are becoming increasingly vociferous and hostile to western influence. In Mali, where 90% of the population is Muslim, a recent conference of Islamic associations heard imams demand that only those who “espouse Islamic values” should be presidential candidates.

Most seriously, in Nigeria, where over half the population is Muslim, some 7,000 people have been killed in religious and ethnic violence in recent years. Over 500 people have died in the northern town of Jos alone this month, with some of the worst fighting between Christians and Muslims apparently fired by news of the attacks in America. Since military rule ended in 1999, politicians have used religion as an electoral weapon and a dozen state governments in northern Nigeria have introduced hardline *sharia* law. The federal government is anxious to see an end to the resulting violence, lest it destabilise all of Nigeria. Restoring peace would be hard enough if the world were calm, but in the face of an international hunt for Muslim terrorists, it may be impossible.

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Somalia

Into the vacuum

Sep 20th 2001 | MOGADISHU
From The Economist print edition

Islam's influence is increasing

HOPING to cash in on the bogeyman of the day, some of Somalia's warlords are accusing the one-year-old interim government of turning this battered country into an Islamic state. Their clan-based militias still rule large tracts of fragmented Somalia, 11 years after the overthrow of its dictator, Siad Barre. They used to fight each other, until some of them formed an alliance against the new government.

But the government has had little to do with the rise of Islam. Traditionally, Somalia had a strict and sometimes brutal social code, but its version of Islam was relaxed. The trauma of the war and the destruction of the state made people turn to God and to the only institutions still standing, Islamic ones.

Before the war, for example, only married women wore headscarves. Now virtually no woman goes bareheaded, and even young girls wear the Arab *chador* (many of them obtained in relief packages from Arab NGOs) wrapped nunnishly around the head and neck. In Mogadishu 50 of the 70 girls' schools are run by Arab NGOs. For 90% of Somali children, the only available schools are koranic.

Post-colonial Somalia used *sharia*, the Islamic legal code, for its family law and, since the breakdown of the state in 1991, it has been the only law of any kind. The first courts were established in 1993 as an emergency response to disorder in north Mogadishu. One of its judges, Sheikh Ali-Dheere, cut off a dozen or so hands and reportedly cleaned up the streets overnight. More courts sprang up, backed by Arab NGOs and policed by militias.

The government recently announced that the *sharia* courts would be taken over and their judges retrained alongside qualified lawyers. In theory, the new courts will have three judges, including one for *sharia* elements. In practice, of the 100 judges who applied for the government refresher course, 80 were from the *sharia* courts. So, for the time being, *sharia* remains.

One member of the government, Sheikh Hassan Dahir Aweys, predicts that *sharia* will one day be recognised as the law of the land. But he says it will not be applied to Somalia's war criminals. “If we try the warlord killers, Americans will say, ‘Fundamentalists are killing people',” he claims. “So we say, ‘You do it, then'.”

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About sponsorship

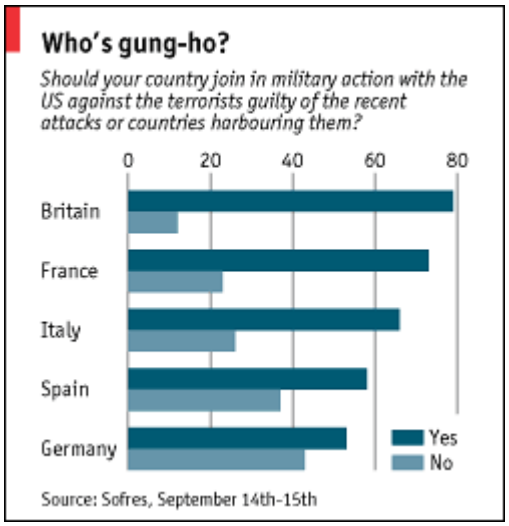
Europe and the United States

Solid, but for how long?

Sep 20th 2001 | BRUSSELS
From The Economist print edition

European solidarity with the United States will depend on just what a global "war" against terrorism entails

A WEEK after the terrorist atrocities in America, the talk in the European Union was all still of "solidarity". "We stand four-square with our American allies and friends," said Chris Patten, the EU's commissioner for foreign affairs, in a statement echoed by scores of politicians across the continent. Opinion polls showed that most West Europeans wanted their governments to take part in military action against terrorism, with the French almost as eager as the British (see chart). Though Germans in general are edgier, Chancellor Gerhard Schröder has sounded as robust as the French. Mr Bush's team won widespread praise from European governments for its measured response—and for its refusal to shoot back straight away.



But the possible limits to European support for the United States are also becoming evident. No European government is likely to have reservations about going after Osama bin Laden, although some officials are uneasy about the amount of evidence so far furnished by the Americans. If the number of civilian casualties can be kept down, a wider strike against the Taliban is also likely to win broad support. But some European officials and pundits are openly worried about what a global war on terrorism and, crucially, on the states that sponsor it might lead to.

Even before the attacks on its cities, the United States had an official list of seven countries that it regards as terrorism's state sponsors: Cuba, Libya, North Korea, Iran, Iraq, Sudan and Syria. A recent State Department report also named Afghanistan as "a primary safe haven for terrorists". Some European diplomats fear that the United States may now seek to take on a whole range of "state sponsors", sparking conflict across the Middle East. Although Colin Powell, America's secretary of state, is widely seen as a voice of moderation and caution, there is anxiety in some quarters of Europe about the instincts of Donald Rumsfeld and the Pentagon.

It was noted with relief in Brussels and elsewhere that in the attacks' immediate aftermath, America and Iran appeared to undergo something of a small rapprochement. But it is also clear that a strong school of thought in the United States considers Iraq to be the main state promoter of terrorism. A recent book arguing that Iraq was behind the first attack on the World Trade Centre, in 1993, has won plaudits from, among others, Paul Wolfowitz, now Mr Rumsfeld's deputy at the Pentagon.

If the United States chose to attack Iraq without convincing public evidence of its involvement in the latest terror, Europe's solidarity might begin to crack. The anti-Saddam coalition that the United States built up during the Gulf war has fizzled. France dropped out of the air patrols over Iraq's "no-fly" zones in 1998, leaving Britain as America's only ally in the skies. A clutch of French MPs has visited Baghdad, Iraq's capital. France has its eyes on lucrative Iraqi oil contracts, if and when UN sanctions against Iraq are lifted. Many governments and people in the EU now think sanctions against Iraq are ineffective—and needlessly cruel to ordinary Iraqis.

If the attempt to widen the war on terrorism beyond Mr bin Laden and Afghanistan is confined to judicial and intelligence co-operation, the EU should stay enthusiastic. But broader military strikes may cause public unease, except perhaps in Britain, with its emotional and security ties to the United States. Europe's reluctance is not just to do with evidence or with fear of the humanitarian consequences of military action. For all the talk of the attack on America being “an attack on all of us”, some Europeans fear that if they cleave too closely to a broad, punitive American policy, terrorist reprisals against European cities will be far more likely. Rudolf Scharping, Germany's defence minister, at first seemed to distance himself from American war talk by cautioning against the use of emotive language: “We aren't on the brink of war.”

A lot of Europeans, hoping that their advice may temper what they regard as the Pentagon's wilder instincts, say that the Americans should consult them—and “co-operate” with them—more. This partly reflects some Europeans' long-standing resentment of what they see as America's high-handedness. In this view, common in Paris, Berlin and Brussels, the crisis may have a beneficial side-effect if it makes America seek more equal relations with its European allies. But members of the British government tend not to take this line. A senior British politician points out that “America considers that it has a fundamental responsibility to respond to an attack on its own soil. What action Americans take is a matter for them.”

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Russia and the United States

Poacher turned gamekeeper

Sep 20th 2001 | MOSCOW
From The Economist print edition

Russia wants to fight terrorism—except when its friends are involved

AP

A Russian prays for America

A DODGY and demanding ally, but perhaps a necessary one. That is what America sees as Russia leaps to embrace the global anti-terrorist cause. There is no doubting the Kremlin's enthusiasm, on the surface at least. President Vladimir Putin compared the perpetrators of the onslaught against America to Nazis—still the harshest term in Russia's political lexicon. “We face a common foe,” he said.

At first sight, Mr Putin's lot have handy experience—for one thing, in fighting against what they call “Islamic terror gangs” in Chechnya. Russia's several thousand troops in Tajikistan, an impoverished and strife-ridden republic on the southern border of the former Soviet Union, are the closest European-led military force to Afghanistan. And Russia helps the former government in Afghanistan itself to control a sliver of land in the country's north. The Kremlin also has a powerful say in the affairs of the other Central Asian republics, some of which say they might lend bases to America—which would be invaluable in the event of a big war in Afghanistan.

But Russia's own record against terrorism is mixed, to say the least. In detective prowess, it scores poorly. The authorities blamed Chechens for the bombs in Moscow and elsewhere in 1999 that cost 300 lives and provoked the latest war there. But the subsequent investigation was remarkably sloppy; the closed trial of the alleged bombers now under way in Stavropol, in the south, raises many doubts.

Russia's real experience of international terrorism was gained more dubiously. Until its final years, after all, the Soviet Union gave violent “anti-imperialists” a hand. Only this week, for instance, a former senior KGB officer, Anzor Jaiani, now the security chief of Ajaria, a seamy, semi-independent bit of Georgia that enjoys close ties to Russia, reminisced about playing football with Carlos (full name, Ilyich Sanchez), a notorious Soviet-trained terrorist now serving a life sentence in France.

In the 1990s Russia flirted with terrorism as a way of unsettling uppity bits of the former empire. Igor Giorgadze, an ex-KGB man wanted in connection with the attempted assassination in 1995 of Georgia's president, Edward Shevardnadze, escaped on a Russian military aircraft to Moscow. Russia brushes off Georgian extradition requests, pleading ignorance of his whereabouts—although journalists have no trouble finding him.

As for Russia's ability to deal with rebellion and terror in Chechnya, its record is dismal. Despite frequent assertions of imminent victory, the war still looks unwinnable. This week it boiled up again as the rebels killed several dozen Russian soldiers, including a clutch of top brass, and raided the two main cities, Grozny and Gudermes. All the main rebel commanders remain at large, including the Jordanian-born Khattab, one of the handful of outsiders on the Chechen side and reputedly a close friend of Osama bin Laden's. Russian intelligence said this week that one of the suicide attackers in America was a veteran of the Chechen war.

Moreover, Russia remains an enthusiastic friend and arms supplier to several countries that sponsor terrorism, such as Libya, Iran and Iraq. This has already prompted American sanctions against specific Russian companies and institutions. America says there is a “100% overlap” between stopping the proliferation of advanced weapons and fighting international terrorism. If Mr Putin truly wants to help

beat terrorism, he will have to give up some lucrative deals and old friendships. Russia does look set to pay at least lip-service to a common anti-terrorist front, but if American retaliation goes awry, it may become more sceptical.

The most immediate issue for Russia's leaders remains Chechnya. Attempts to portray the war there as a simple struggle between a European democracy and a few gangs of Islamic fanatics and terrorist gangsters have fallen flat. Now their queasy western audience may be keener to listen.

This week Russia sent a tough diplomatic note to Georgia demanding the extradition of the “hundreds” of Chechen fighters supposedly sheltering there, as well as the closure of a Chechen information centre in the capital, Tbilisi. “It is time for Georgia to join the united front of civilised states to remove the threat of international terrorism,” it said. If the Americans go along, it will be quite a shift. Georgia has so far been one of the former Soviet republics they have been trying to nudge away from Russia and towards the West.

Also nervously watching this sudden Russian love-in with the West are the Baltic countries. Russia strongly opposes their bid to join NATO. With a real war to fight, and a new need to be polite to Russia, the alliance's appetite for expansion may be dulled. The Russians, in sum, may have a good chance to score points with the Americans while strengthening their own position along their old fringe, especially in the lands to their south.

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France and the United States

Good for the (French) president

Sep 20th 2001 | PARIS
From The Economist print edition

France is more solid than usual behind America—to President Chirac's benefit

“SOLIDARITY” is the official buzzword in France too. The country so often at odds with America will be “totally supportive”, says President Jacques Chirac, who on September 18th became the first European leader to meet President George Bush in the aftermath of the carnage in New York and Washington just a week earlier. The word is undoubtedly sincere. Opinion polls say that the French overwhelmingly favour participation in any American military retaliation. Might that change?

France's foreign minister, Hubert Védrine, has openly worried that a badly conceived American reaction would lead to “the monstrous trap”, planned by the terrorists, to pit the West against Islam in a “clash of civilisations”. In his talks in the White House, Mr Chirac tried hard to avoid the verbal bellicosity of his host. “I'm not sure”, said the French president, “that one should use the word ‘war'. What is certain is that we have a conflict of a new nature.” Indeed so. But in the end Mr Chirac politely gave way: “I don't want to have a semantic quarrel. This is a war that must be waged on all fronts.” He had “not the least reticence” over America's plans.

That, of course, is more easily said while those plans are still unclear. It is one thing to offer “heartfelt solidarity”, quite another to offer French troops on an overseas mission or to expose the French at home to an increased risk of terrorism. French ministers and officials point out that, although Article 5 of the NATO treaty, invoked for the first time ever in response to the terrorist attacks, states that an attack on one member is an attack on all, national governments still retain the right to decide how they should respond.

Does this add up to solidarity-breaking squeamishness from a country that has long had uneasy relations not just with America but with NATO? The French say not, arguing that Mr Chirac, whose trip to America was originally meant to be for a now-cancelled Unicef summit in New York, was simply the first to impress on Mr Bush, face to face, the reservations already made by telephone by several European leaders, including Britain's instinctively pro-American Tony Blair.

In the same breath, and despite Mr Bush's unfortunate use of the word “crusade”, they note approvingly that the administration is so far proceeding with great care. Indeed, a former French intelligence chief noted the increased role of the war-hardened Colin Powell, a secretary of state who the French feel has hitherto had too little influence on the president. Add the American-encouraged ceasefire between Israelis and Palestinians, and French officialdom is somewhat reassured.

But not entirely. Out of France's 60m people, up to 5m are Muslim, four-fifths of them of North African origin. Hardly surprisingly, they include a few willing to commit acts of terror on behalf of Algeria's fundamentalists or Palestinian extremists or, it seems, Osama bin Laden. One of the suspects being held in America, Zacarias Moussaoui, is a French citizen of Algerian parentage. In July France jailed another alleged accomplice of Mr bin Laden, an Algerian called Mohamed Bensakhria. And for almost six years France has been trying to get Britain to extradite an Algerian called Rachid Ramda, accused of an attack on a Paris Métro station.

No wonder, the day after the terrorist attacks on America, that France beefed up its Vigipirate programme, an anti-terrorism measure first used in 1986 and later reactivated during the Gulf war in 1991 and, in 1995, during the Algerian civil war. This accounts for the increased—and conspicuous—presence in their bullet-proof jackets of well-armed police, gendarmes and soldiers around public buildings, airports and railway stations.

Meanwhile, as an American politician once put it, all politics is local. In the French context this means

that America's tragedies have come as a godsend to the centre-right Mr Chirac in his campaign to be re-elected president next May. Suddenly, no one is talking about all the scandals swirling around the president (the supreme court is due to rule early next month on his immunity from questioning). Instead, he is being convincingly “presidential”. By contrast, his presumed opponent in the election, Lionel Jospin, the Socialist prime minister with whom the voters have forced Mr Chirac to “cohabit” for the past four years, is—according to the reported words of Mr Chirac—“number two. He respects what I tell him to do.”

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Hamburg's election

Day of judgment

Sep 20th 2001 | HAMBURG
From The Economist print edition

A draconian judge turned politician is stirring up Hamburg

AP

Judge Merciless for interior minister?

HAMBURG is an elegant, prosperous metropolis with a reputation for openness and tolerance. In a recent study that rated German cities' quality of life, it came top. Its mayor, Ortwin Runde, is popular. Yet the Social Democrats, who have ruled the city-state for 44 years, may be ousted by its voters on September 23rd.

The reason is Ronald Barnabas Schill, a judge. A dangerous xenophobic demagogue, say some; an overdue champion of law and order, say others. Few people had heard of him until he set up his own party barely a year ago, but "Judge Merciless", as he is known for his draconian sentences, is fast becoming a household name. He wants to castrate sex offenders, administer emetics to suspected drug dealers, lock up juvenile delinquents and expel foreigners convicted of serious crime. Pollsters say he stands to grab 14% of the vote in the city with Germany's highest crime rate.

Mr Schill says that foreigners, a fifth of its 1.7m people, account for over 70% of its young offenders, 70% of its drug-dealers, 50% of its murderers, 40% of all criminals—and get a third of the city's welfare. Three of the apparent hijackers in last week's terrorist attacks in America had been students in the city. They had chosen the right place to prepare for their crimes, Mr Schill comments caustically. Put him in power, and crime would be halved in 100 days.

Wherever Judge Merciless goes, people flock to hear him. His mainly lower-middle-class, middle-aged audience listens with rapt attention. This upright, good-looking, earnest man in his early 40s knows what he's talking about: he's a judge! In horror at his tales of laxity, the listeners mutter their approval of his hang-'em-and-flog-'em proposals and cry out in disgust at the billions of public D-marks—*their* D-marks—that are spent pampering criminals and foreigners.

In any event, Mr Schill could soon be Hamburg's interior minister. He has already formed an alliance with the opposition Christian Democrats, and they are reported to have offered him the job if they win office. The election is still wide open, with the Christian Democrats and Mr Schill's party neck-and-neck with the ruling coalition of Social Democrats and Greens. This could leave the Free Democrats, Germany's liberal party, holding the balance of power, though the latest polls suggest they may not be able to muster the minimum 5% required to get them into the city-state's parliament. Even if they do, it is not clear which way they will jump.

National politics is also involved. The liberals say that Hamburg needs a change, but do not want to jeopardise their dream of a coalition with Chancellor Gerhard Schröder's Social Democrats after next year's general election. Meanwhile, some Christian Democrats, desperate to recover their national standing, are ready to flirt with xenophobia, disguised as concern for "national identity". On this theme, Roland Koch won the premiership of Hesse in 1999 and has suggested that his party should adopt it for its next general-election campaign. Angela Merkel, the Christian Democrats' national leader, welcomes the idea; others remain dubious. The outcome of Hamburg's election may help them to make up their minds.

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Charlemagne

Recep Tayyip Erdogan

Sep 20th 2001
From The Economist print edition

Turkey's latest Islamic leader is the country's most popular politician

AS THE West ponders its response to terrorism, the importance of Turkey, the sole Muslim country in NATO and Israel's only regional ally, is plain. Yet the country's rocky economy and mucky politics are alarming. Opinion pollsters reckon that, if a general election were held today, Turkey's main new Islamist party would easily win, and its leader, Recep Tayyip Erdogan, a popular but somewhat questionable former mayor of Istanbul, would have a fair chance of becoming prime minister. What might that do for regional stability in so combustible a part of the world—where Turkey, for all its manifold faults and fissures, has long been a beacon of comparative calm and sanity?

For one thing, a general election is not due until 2004, and the ruling three-party coalition, embracing both the moderate and secular left and the ultra-nationalist right, seems secure for the moment. For another, Mr Erdogan is at pains to reassure people at home and abroad that he has changed his mind about many matters. He was quick, for instance, to condemn the terrorist outrages in America last week. And he no longer says that Turkey should leave NATO.

All the same, Turkey's generals, who still pull strings behind the scenes, are keen to keep Mr Erdogan out of power. But the economy is still in a mess, and the ranks of the discontented swell by the day. If the authorities were seen to persecute Mr Erdogan, his support might grow. It is certainly conceivable, so long as the generals and judges hold off, that he and his new Justice and Development party, better known by its initials AK, could be running Turkey in the not-too-distant future.

Born 47 years ago into a poor family that migrated to Istanbul from a province on the Black Sea coast, Mr Erdogan got his street education as a teenager peddling lemonade and *simits* (sesame buns) in one of Istanbul's roughest districts. After attending an Islamic school for would-be imams, he played football professionally for a team sponsored by the city's transport authority, while taking a degree in management at Istanbul's Marmara University. It was then that he fell in with Necmettin Erbakan, who dominated Turkey's Islamic movement from the 1960s until losing control over a big chunk of it—to Mr Erdogan—this year.

The new man's first brush with Turkey's soldiers came after their coup of 1980, their third in the space of 20 years, when his boss in the transport authority, a retired colonel, told him to shave off his moustache. Mr Erdogan refused—and went into business and politics instead. His star in Welfare, as the Islamists' party was known in the 1980s and most of the 1990s, rose fast. In 1994 he was elected mayor of Istanbul, Turkey's grandest city, on the fulcrum between Europe and Asia.

Even his fiercest critics acknowledge that he did the job well. He improved the water supply, cleared slums, tackled pollution and planted thousands of trees. Though the state prosecutor is sniffing into allegations of foul play to do with municipal tenders, most people reckon Mr Erdogan was pretty honest—in contrast to many of his critics within government.

As mayor, he also subscribed to many of the tenets of political Islam. He banned alcohol in restaurants run by the municipality. At first he inveighed against the UN as well as NATO, calling them both lackeys of the United States. He opposed Turkey's ambition to join the European Union. He was loth to condemn intolerance in neighbouring Iran, while claiming that Muslims in the West were not allowed to practise their religion freely. In a video recorded in 1995 but recently shown on Turkish television, he angrily declared, “You cannot be secular and a Muslim at the same time. The world's 1.5 billion Muslims are waiting for the Turkish people to rise up. We will rise. With Allah's permission, the rebellion will start.”

Today he sings a new tune. “The world has changed and so have I,” he says. His new party, he insists,

“has no demands for a religion-based state...Our party is not an Islamic one and I am not an Islamist—I'm just an observant Muslim and that's my own business.” Joining the EU is now, he says, a “necessary goal” for Turkey, which should even maintain “mutually profitable” relations with Israel. He even sounds unfussed about whether women should be allowed to wear the Islamic headscarf in government offices and schools. At present, they are not.

Believe him or not

The generals, along with many secular-minded Turks, are unconvinced. However much Mr Erdogan stresses his new-found moderation, his party is heir to the Islamist parties of the past. He still knows little of the outside world, nothing about economics, and no foreign language. Some fear he might change his tune once again if he got his hands on the levers of power.

In 1998 the Constitutional Court banned the Welfare party, the AK's forebear, on the shaky ground that it sought to impose religious rule. Shortly after, Mr Erdogan was kicked out of the mayor's office, banned from politics for life and sentenced to ten months in jail, four of which he served, for reciting a nationalist poem deemed to urge religious rebellion. This year the Virtue party, which replaced Welfare, was banned too. Now Mr Erdogan has persuaded 51 MPs from the banned party to join his AK, which means “white” in Turkish, declaring that the new group, already the second-largest opposition party in parliament, should embrace “all Turks, on right or left, devout or not”. The chief prosecutor, still gunning for Mr Erdogan, says he should be ousted as the AK's leader because of his previous conviction.

Turkey's Islamists are a mild lot compared with some of their fearsome counterparts elsewhere. Their occasional calls for *jihad* (in the sense of holy war) have never gone beyond rhetorical bluster—and have landed quite a few of them in jail. These days Mr Erdogan sounds milder too. But if things continue to go wrong in a secular-minded Turkey, who knows what the future may hold?

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Reactions

We're with you, sort of

Sep 20th 2001
From The Economist print edition

Reuters

Support for the United States is diluted by fear and anti-Americanism

BRITISH people, say the opinion polls, are solid in their support for America. Two-thirds approve of the idea of military strikes in retaliation for the attacks, and half are willing to see Britain involved in military action alongside America. British politicians, too, are maintaining a pretty united front. The day after the bombings, Tony Blair said that “We stand shoulder to shoulder with our American friends in this hour of tragedy and we, like them, will not rest until this evil is driven from our world.” Iain Duncan Smith, the new Conservative leader, even suggested a temporary cessation of hostilities with the government while the crisis was on.

Yet opinion in Britain is more ambivalent than this suggests. There is much sympathy for America, but there is also fear among many, and hostility among a few.

The special relationship, which has been a source of comfort and security for Britain for most of the past century, is also a source of fear. Britain's role is to moderate between America and the rest of the world. Many Britons are afraid that America may do something dangerous, and that Britain will necessarily be implicated. The City of London is no less a symbol of global capitalism than Manhattan. It's got big towers, too.

Hostility to America is confined to two groups. A few Muslims have come out in support of Osama bin Laden, including an obscure organisation called al-Muhajiroun, which claims that a body called the Shariah Court of the UK has issued a *fatwa* against the Pakistani leader, General Pervez Musharraf, calling for his murder.

Leaders of other Muslim bodies have condemned this group as extremist and without influence. Their determination to distance themselves from its views is sharpened by a series of attacks on Muslims over the past week. An Afghan taxi-driver has been left paralysed; a Muslim girl was beaten with a metal baseball bat; many have reported harassment. After a summer of riots between mobs of Muslim and white youths, relations between the two communities were already uncomfortable in some parts of the country. Muslims fear they are getting worse.

The other source of anti-Americanism is the left. Not that most politicians are expressing such views openly. Only Clare Short, the overseas development minister, has voiced any dissent. She said, on the question of whether the attacks constituted war, “I don't think strident language is helpful, but I think it's understandable, and what's really important is that we don't get strident action.” To the prime minister's office, this sounded too much like opposition to a retaliatory strike, and Ms Short received a coded rebuke.

With politicians mostly muzzled, the left's anti-Americanism has found public expression in the media. The *New Statesman*, once the bible of the intellectual left, ran a leader which dispensed with even a cursory expression of regret before getting on with the business of fingering the guilty party. It bade the reader look at the pictures of Americans running from the collapsing buildings “and then ask yourself how often in the past...you have seen people running in terror from American firepower. American bond traders, you may say, are as innocent and as undeserving of terror as Vietnamese or Iraqi peasants. Well, yes and no.” The Americans were guiltier than the Vietnamese or Iraqis, the magazine explained, because they had failed to elect Al Gore or Ralph Nader.

On the BBC's “Question Time”, in which a panel of serious people discuss the week's events, Yasmin Alibhai-Brown, an Ismaili writer, spoke of “certain countries [who] strut around thinking they're better than everybody else”. Heckling by members of the studio audience left Philip Lader, the former American ambassador, visibly upset. Greg Dyke, the BBC's director-general, later apologised.

Many of the sources of this anti-Americanism are familiar—envy of the rich and powerful, dislike of unbridled capitalism, fear of the corrupting influence of American films and hamburgers, that sort of thing—but British history gives it a particular local spin.

The British left's attitude to the rest of the world was formed by the painful business of giving up global power. High-handed Conservative policies—especially the decision in 1956 to invade Egypt after General Nasser nationalised the Suez Canal—drove many middle-class young people into the Labour Party. They have been apologising ever since for Britain's behaviour as a colonial power.

Britain, in their view, has learned from its humiliation, while America behaves with the same arrogance as Britain once did. Because America is powerful, it has got away with it. Now it will get away with it no longer. So there.

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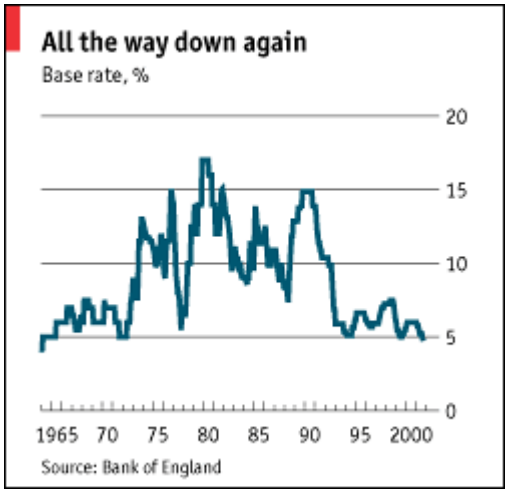
The economy

The Bank joins in

Sep 20th 2001
From The Economist print edition

Interest rates are down to their lowest level for a generation



AFTER the half-point reduction in interest rates by the American and European central banks, a quarter-point was the least the Bank of England could offer to rally markets and business in the wake of the terrorist attacks on America. Even so, the cut to 4.75% brought interest rates down to their lowest level since 1964.

After a special meeting of its monetary policy committee, the Bank said it had cut rates because falls in stockmarkets around the world and the likely impact on confidence pointed to a weaker outlook for global activity. The statement reflected the fact that the London stockmarket declined less than other bourses in the week after the terrorist attacks on America. Whereas the Dow Jones index fell by 7% when the New York stock exchange re-opened on Monday, the FTSE 100 closed only 3% down over the week from September 10th. Markets in Germany and France fell considerably more.

The main concern for the Bank is that investor nerves reflect broader worries on the part both of businessmen and of consumers. One reason why equities flourished in the 1990s was that the end of the cold war and the success of the Gulf war in 1991 made the world seem a safer place. Now that it seems much more dangerous, the natural reaction is to batten down the hatches. Companies put investment plans on hold; consumers postpone big-ticket purchases.

As this is replicated in countless decisions around the world, so Britain will feel the downdraught. When the Bank decided to keep interest rates on hold in early September, it was expecting the American economy to pick up speed in the second half of the year. Now an American recession seems inevitable, which will lead to lower demand for imports. That in turn will hurt British exporters already suffering from the world slowdown. Forecasters are revising down their predictions for growth in Britain. For example, the Centre for Economics and Business Research has lowered its forecast for 2002 from an already pessimistic 2.2% to 1.5%, because of slower world growth and poorer prospects for domestic investment.

If the outlook has thus become gloomier, why has the Bank cut rates by only a quarter-point rather than the half-point reduction made by other central banks? One constraint was that the latest figures for inflation show a sharp increase from 2.2% to 2.6% a year, taking it above the government's 2.5% target for the first time since early 1999.

However, inflation lags the economic cycle. The Bank sets interest rates to steer inflation in 18-24 months' time towards the 2.5% target. Inflation responds to the strength of overall demand in relation to capacity and will fall as lower growth opens up slack in the economy. The main reason for the Bank's cautious response is that it expects Britain to ride the storm somewhat better than other big economies. That in turn is partly because the government is fortuitously delivering a well-timed fiscal stimulus through its spending spree on the public services.

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Northern Ireland

The America effect

Sep 20th 2001 | BELFAST
From The Economist print edition

Horror in Manhattan may have helped shift the IRA

Hume the peacemaker goes

WHEN on September 19th the IRA made a gesture to keep the faltering peace process going, nobody thought the movement had spontaneously converted to compromise. The impetus, it is generally believed, came from America—from the administration's fury at the discovery of contacts between the IRA and Colombian guerrillas, and from the anticipated revulsion against terrorism of all types in the country that had been IRA's richest and most dependable backer.

Until the IRA's statement, the news was all bad. One of the architects of the peace process, John Hume, announced earlier this week that he was stepping down as leader of the moderate nationalist SDLP. And no progress on decommissioning IRA weapons meant that this weekend, John Reid, the Northern Ireland secretary, was due to suspend the devolved Assembly.

The timetable goes back to the resignation in July of David Trimble, leader of the Ulster Unionists, as First Minister of the Assembly. Mr Trimble refuses to return to work until the IRA makes significant moves towards decommissioning its weapons. Temporary suspension is possible; but, with no progress on peace, there seemed no point in dragging the thing on. The Assembly was therefore expected to be suspended indefinitely; but the IRA's statement changes expectations.

Pressure on the IRA from America was likely after the recent arrest in Colombia of three republicans, one a convicted IRA bomber, involved with FARC guerrillas. The Colombian military has since claimed that up to a dozen republicans had visited the FARC-controlled territory in the past year. Last week, President Bush's envoy to Northern Ireland, Richard Haass, said there would be “consequences” unless contacts between FARC and the IRA stopped immediately. The suggestion was that Sinn Fein would lose the visas and permits to raise funds which the Clinton administration had granted it.

Now the attacks on America have made things still worse for the IRA. Many British commentators have remarked on the irony of Tony Blair declaring war on terrorism, whilst negotiating with Sinn Fein. The IRA, after all, has murdered hundreds of civilians though it has generally given warnings before setting off bombs.

The IRA's statement offers nothing concrete. All it has said is that it is ready to enter into more detailed discussions with General John de Chastelain, head of the international body set up to oversee the decommissioning of weapons. This is familiar ground. Six weeks ago, General de Chastelain announced that the IRA had agreed to put its weapons beyond use; unionists said the offer was too vague; it was withdrawn.

But the IRA's move is at least a move. As a result, the government is unlikely to suspend the Assembly indefinitely. It will probably use the legal fiddle it used six weeks ago and suspend it for a further six weeks. Not progress, exactly, but better than the reverse.

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The BBC

New Labour, new chairman

Sep 20th 2001
From The Economist print edition

The BBC is getting too close to government for comfort

Get article background

BBC

Davies, the BBC's defender

THE appointment of Gavyn Davies as chairman of the BBC might seem to herald a shake-up at the corporation. As chief international economist at Goldman Sachs, Mr Davies received a £100m ($160m) windfall when the investment bank was floated in 1999. Surely he is just the man to prepare the BBC for a more commercial future once its current charter, and thus its right to collect a licence-fee from television-owners, runs out in 2006?

Not at all. Mr Davies, who has been the corporation's deputy-chairman since January this year, is a zealous advocate of public-service broadcasting. He believes passionately that a state-owned and publicly-financed institution knows better than the market how to make decent programmes. He is convinced that the existence of the BBC, with its 24,000 employees and 23,000 hours of TV broadcasting each year, lifts the standard of all British programming. And his definition of public service is broad: he regards the BBC as an instrument of public policy, whose job is to bridge the “information divide” between the haves and have-nots.

What is more, because of the compulsory licence fee, Mr Davies considers it the BBC's obligation to reach out to those viewers whom the corporation feels it is “losing”, like young people. That is why a committee he chaired two years ago backed an increase in the licence fee to finance the BBC's expansion of its digital channels. The government does not entirely share his conviction that the BBC can be everything to everybody. Last week, Tessa Jowell, the media minister, turned down the BBC's application to run a “youth” channel, while approving others for “intellectuals” and children. The government evidently felt that the market was delivering quite enough of whatever it was that “youth” wanted.

Mr Davies's ardent defence of public-service broadcasting should perhaps come as no surprise. His left-of-centre roots run deep. In the 1970s, he worked in Downing Street for two Labour prime ministers. He is close to Tony Blair. His wife, Sue Nye, runs the office of the chancellor, Gordon Brown. Hence the outrage in Tory circles this week at the installation of yet another of “Tony's cronies” in a top public-sector job. Greg Dyke, the BBC's director-general, is also a Labour man.

If the BBC and its supporters are pleased that the corporation will have such a cosy relationship with government, they are wrong to be. The BBC is valued for its high-minded neutrality. At times of crisis, that is especially important—and especially vulnerable.

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The Tory shadow cabinet

Lurch to the right

Sep 20th 2001
From The Economist print edition

The new Tory leader's shadow cabinet will not solve his problems

IAIN DUNCAN SMITH, the Conservatives' new leader, has already made his mark on the party by assembling a shadow cabinet more right-wing and Eurosceptic than Margaret Thatcher ever did. Lady Thatcher and her successors, John Major and William Hague, were at pains to balance the party's differing factions. Mr Duncan Smith, by contrast, has surrounded himself with people who agree with him.

To be fair, he had little room for manoeuvre. First, the bruising three-month leadership contest had left him with a number of political debts to be settled. That explains the appointments of David Davis as party chairman, Bernard Jenkin as defence spokesman and Michael Ancram as shadow foreign secretary. Second, two of the Tories' biggest figures, Ken Clarke and Michael Portillo, whom he had beaten in the leadership contest, indicated that they were not prepared to serve under him. So too did many of their supporters who had served in the last Conservative shadow cabinet—notably Francis Maude, Archie Norman, Andrew Lansley and Ann Widdecombe.

That left Mr Duncan Smith with only the odd bone to throw to his opponents. The only Europhiles in the shadow cabinet are Damien Green (education), Jacqui Lait (Scotland) and Quentin Davis (Northern Ireland). But even given the difficulties, some of Mr Duncan Smith's appointments look bizarre. In his memoirs, John Major accurately described William Cash, the new shadow attorney general, as “obsessive, driven and, on Europe, frankly a bore”.

The most interesting omission is John Redwood. When he made his leadership bid after the last election, his campaign manager was Mr Duncan Smith. But all he was offered in a 15-minute meeting last week was shadowing the Department of Trade and Industry. Mr Redwood turned this down on the grounds that this was a job he had already done once.

Mr Redwood would anyway have found it difficult to work with Michael Howard, the surprise choice as shadow chancellor. The friction between the two goes back to the traumatic event that helped destroy Mr Major's government, Britain's forced departure from the European exchange-rate mechanism (ERM) in September 1992. Mr Redwood opposed the ERM. Mr Howard defended it to the last.

Mr Howard is a curious choice. Although a formidable debater who will give Gordon Brown, the chancellor, a hard time as the economy turns from boom to bust, he has limited public appeal and brings back memories of a period that the Tories now prefer to forget.

The lone liberal is Oliver Letwin, shadow home secretary. Originally a supporter of Mr Portillo's, he will press for more modern attitudes to sensitive issues such as homosexuality and decriminalisation of cannabis. “There won't be a big shift in policies overnight but it's intended to achieve a significant change in tone in the way we discuss these matters,” says a Tory insider.

On Europe, however, the message is uncompromising. Some Tory Europhiles are now certain to leave politics. Others are looking for new political homes. Two Tory MPs, Alan Howarth and Shaun Woodward, defected to the Labour Party in the last Parliament. This time the Liberal Democrats may benefit. Steven Norris, a left-winger who has been sacked as deputy chairman of the party, says he may leave if Mr Duncan Smith pushes the party further to the right. “He is on probation,” according to Mr Norris. A backbencher's verdict that the “lunatics are now in charge of the asylum” is a sign of a wider discontent.

Presumably Mr Duncan Smith hopes that by appointing a shadow cabinet more united than its predecessors, he will avoid the public infighting of recent years. But his lurch to the right is unlikely to

heal divisions within the party, let alone appeal to the millions of voters who have deserted the Conservatives over the past decade.

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Equitable Life

Compromise or bust

Sep 20th 2001
From The Economist print edition

Now the insurer has to win support for its long-awaited deal

AFTER months of preparation, Equitable Life has at last unveiled its plan to sort out the mess that has brought the pension provider to its knees. The mutually owned insurer's hope is that its members will vote for a settlement that will restore certainty and confidence. It will also trigger a further payment of up to £500m from HBOS, the bank born of a merger between Bank of Scotland and Halifax, which acquired Equitable's operating assets in March.

The package has to satisfy the two classes of Equitable's 1.1m policyholders with a stake in the £22 billion with-profits fund whose conflicting interests, created by the company's past promises, have proved so damaging. The first has policies with the option of guaranteed annuity rates (GAR), which have become valuable since market annuity rates fell below them. A judgment by the Law Lords in July 2000 forced Equitable to honour these guarantees after several years in which it had sought to nullify their worth. Around 175,000 individuals—of whom 105,000 are in group schemes—hold such policies.

The second and much bigger group of members is not so fortunate. They do not have policies with these guarantees, so the cost of honouring them must involve a transfer from their own shares of the insurer's assets. However, they have counter-claimed that they are the victims of mis-selling, because they were not told that there was this hidden liability.

There are conflicting legal opinions about the likely success of such a claim in the courts. One uncertainty is how far back the claims might extend, whether to the initial ruling by the Appeal Court against Equitable in January 2000 or possibly as far back as the late 1980s. In addition, there is uncertainty about whether the non-GAR policyholders would be able to pass the cost of the mis-selling on to the GAR policyholders or whether they would, in effect, mainly be suing themselves.

The aim of the deal is to strike a fair compromise between both groups, primarily by crystallising and reducing the potential liability of the guaranteed annuity rates. In its latest return to the insurance regulator, Equitable estimates that the cost of meeting the GAR claims will be £2.6 billion, up from its earlier estimate of £1.7 billion. The increase in just one year illustrates the open-ended nature of the guarantee that is so blighting the insurer's prospects, since it has to set aside reserves in gilts in order to meet the obligation even if this means selling equities into falling stockmarkets.

Equitable is now offering GAR policyholders an average 17.5% increase in their policy values if they agree to waive their rights to the guaranteed rates. This is less than the premium of about 30% on current market annuity rates. However, the insurer argues that this gain may not last, whereas the offer locks in a definite value. It is offering the non-GAR policyholders a 2.5% uplift in their policy values as long as they agree not to make mis-selling claims. The increase is smaller because the potential rights are smaller and the claims are uncertain. Equitable is warning both groups that a failure to compromise will be a “bleak scenario”.

This week's proposals are consultative. If the final compromise deal, planned for November, is to succeed, it will have to win the support of over 50% of the policyholders and more than 75% of the value of the funds in each group. An opinion poll earlier this year suggested that a majority of policyholders was prepared to make a sacrifice to stabilise the fund. But that was before Equitable unexpectedly slashed policy values by 16% in July. For the deal to go through, members must trust Equitable; but little confidence remains in a company that has got things so badly wrong.

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Education

Too testing for some

Sep 20th 2001
From The Economist print edition

The rise in educational standards is faltering

IF DAVID BLUNKETT were still secretary of state for education, he should now be thinking of stepping down. In 1997 he promised to resign if the government failed to meet its targets for literacy and numeracy in primary schools. Now the upward trajectory of test results is beginning to falter (see table). But in government as in corporate life, bosses seldom stay around long enough to take responsibility for their policies' results. Mr Blunkett is now home secretary; and anyway, the targets look increasingly meaningless.

Peaked?

% of children achieving level expected for their age

Key stage 2 (age 11)	1999	2000	2001
English	71	75	75
Maths	69	72	71
Science	78	85	87

Source: National Statistics

This year's slump in the 11-year-olds' results is bad enough. More embarrassingly for the government, it makes the targets set in 1997 for 2002 look virtually unattainable. In maths, that target was for 75% to reach the required standard, and in English it was 80%.

Other age groups did little better. Fourteen-year-olds' English results did not improve, and seven-year-olds improved only marginally in English and maths. Estelle Morris, Mr Blunkett's successor, admitted that she was “disappointed” by the news.

Critics of testing will feel vindicated. The teachers' unions have been arguing for years that the targets set in 1997 were impossibly high, and had more to do with politics than education. Indeed, the slowdown in the rate of improvement is not surprising. When any new target is set, the early gains are most easily won.

The government has acknowledged that it has been over-ambitious. One of Ms Morris's first acts as education minister was to lower the 2004 target for the number of 14-year-olds it intends should reach the standard of maths expected for their age. So the goalposts have been quietly moved anyway.

More worrying is the fact that the tests themselves have become less demanding since their introduction in 1996. A primary school head in south London told *The Economist* that the format for the science and English tests has changed almost every year, and that, in the process, the tests have become easier. He accepts the idea that tests have been useful as a “motivational tool”, to focus the minds of teachers and parents on children's attainment, but says the claim that there has been a gradual improvement in standards over the past six years is “very questionable”. Many secondary schools no longer trust the tests for 11-year-olds, and conduct their own IQ-type tests on their intake from primary schools at the beginning of each autumn term. Test results are a currency which becomes useless when debased.

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Bagehot

His finest hours

Sep 20th 2001
From The Economist print edition

Tony Blair makes a good war leader. It is one of his weaknesses

THERE is a famous grey photograph of Winston Churchill that has come to exemplify what is required of a war leader. He surveys the rubble of wartime London; grim, bowler-hatted, lonely in command. The image hovers obscurely in the imagination of every British prime minister. It was surely in Tony Blair's on his way to Ground Zero in New York, a city whose mayor had already invoked the spirit of the London blitz.

Mr Blair could be trusted, at the scene of the mass murder, to strike the right tone. At lesser moments, such as Britain's grieving for Princess Diana, he has shown a rare ability to soak in and sum up the popular mood. He is grave, not grandiloquent. He is often sincerely moved. This emotional fluency is a wonderful gift in politics, especially at times of war. And this, he insists, really is war. With hundreds of Britons among the thousands of dead, “whatever the technical or legal issues about the declaration of war, the fact is that we are at war with terrorism.”

That seems reasonable. And if Britain really is “at war”, it is worth noting the other qualities that might make Mr Blair a good wartime prime minister. He is, for a start, courageous. During the Kosovo war in 1999, Mr Blair became so convinced of the justice of the cause and the need to prepare for a ground attack on Slobodan Milosevic that he had a flaming row with the over-cautious Bill Clinton, thus putting at risk a friendship that had been of huge benefit in domestic politics, Northern Ireland and international affairs. Courage is good in a war leader.

So is feeling comfortable in the company of military men. One unnamed cabinet minister, quoted in a new book about New Labour, could not believe how fond of his generals the prime minister became during Kosovo. “It happens to all of them, I suppose, but with Tony it was very quick. He loves the way they work.” They probably like him back, since he has proved that he is not afraid to use military power. He committed British troops to a tricky peacekeeping mission in Sierra Leone, authorised an audacious rescue by special forces when some of them were captured, and—alone among European leaders—kept British aircraft in action with America against Iraq.

A sense of the righteousness of the cause, and the ability to convey it, are useful in war. Here, too, Mr Blair scores. For all his talk about a “third way”, Mr Blair's personal philosophy searches out moral certainty. In an interview before Britain's recent general election, he said that he was tending towards

“natural law”, which had interested him at university, and away from utilitarianism. The greatest good for the greatest number was all very well, he mused, but at some point politicians had to make clear moral judgments about good and bad.

In short, Mr Blair has obvious aptitude as a war leader. Less obviously, he faces strong temptations to behave as one.

War is hell

War turns prime ministers into statesmen. “Bulldog Blair rallies the World”, cried a headline in the *Sun*, in a preposterous inflation of Britain's role. (Downing Street hints that Mr Blair is privately restraining Mr Bush, just as Margaret Thatcher, after the 1990 invasion of Kuwait, spurred Mr Bush's father on.) War also turns domestic opponents into irrelevancies. The twin towers were struck just as Mr Blair was due to address a grumpy meeting of trade unionists. Instead of having to defend his plans to extend the role of private firms in public services, he begged forgiveness and sped off with God speed for his tryst with destiny.

The attacks also eclipsed the election of Iain Duncan Smith as leader of the Conservative opposition. This poor man, quite upstaged, offered to put normal politics on hold, but was spurned. The Tories had been arguing that they were America's true friends and that Mr Blair's Labour government had undermined the NATO alliance by helping to create a separate European army and sounding lukewarm about American plans for missile defence. Now it is Mr Blair who pores over war plans with Mr Bush. Being a war leader even helps Mr Blair in his perpetual, enervating, rivalry with Gordon Brown. War is one of the few spheres in which the prime minister can make the big decisions without having to consult, mollify, take account of, appease and generally defer to his ubiquitous chancellor of the exchequer. During such crises, the prudent Mr Brown has a habit of keeping his head down, lest he be implicated in some failure damaging to his presumed succession.

Plainly, a Britain “at war” would benefit from cool and decisive leadership. As one of America's special friends, Britain might be a future target. But the truth is that even Britain, with one of the world's most efficient armies, and a prime minister happy to use it, will be a junior partner in an American-led show. Life at home will continue much as before. In that case, a prime minister who had come to think of himself as a war leader might quickly become insufferable. Indeed, are not Mr Blair's putative strengths as a war leader simply the obverse of his known defects as a peace leader?

Courage is a virtue in war or peace. But the search for moral certainty can look foolish and intolerant in a prime minister whose chief “crusade” is to improve the public services. Mr Blair fell into just this trap when he once defined his foes as “forces of conservatism” that stretched all the way from the killers of Martin Luther King, through the Conservative Party, to teachers and nurses stuck in their ways. In war, it is useful to admire the work of generals. In peace, Mr Blair's desire to run the government as a command system—uncomplicated by the participation of cabinet, Parliament or party—have earned him his reputation as a control freak. Mr Blair is a passionate man with many qualities. Leading a global alliance of good against evil might strike him as a worthier challenge than running Britain, what with its tedious political conferences at seaside resorts, and its carping about trains. But that is still his job.

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OPINION

A crunch of gears

Sep 20th 2001
From The Economist print edition

The tech boom did not end last year. It just noisily changed gear

BACK in February 1999, this newspaper predicted that the wave of industrial activity based on semiconductors, fibre optics, networks and software was “approaching maturity”, and that a shake-out would not be far behind. The frothy boom was destined to fizzle out as the technologies matured and returns to investors declined with the dwindling number of opportunities. All that happened a year or so later.

No special crystal-ball was needed. To anyone who cared to look, it had become clear that the long waves of industrial activity noted in the 1940s by Joseph Schumpeter, an Austrian-born economist best remembered for his views on “creative destruction”, were getting dramatically shorter. To be frank, *The Economist* was intrigued more at the time by the quickening pace of innovation than by trying to forecast precisely when the technology-laden Nasdaq bubble would burst.

When traced back to the Industrial Revolution in 18th century England, Schumpeter noticed that these waves of innovation had ebbed and flowed every 50-60 years. Each fresh wave had brought with it a “new economy” that led to mindless investment and wild excess, followed by a ruinous shakeout, but left the world a richer and better place.

The first such boom, propelled by inventions in cotton-spinning, iron making and steam power, lasted from the 1780s to the 1840s. The second wave arrived with innovations in steel making and railways, lasting for half a century before running out of steam around 1900. The third ran for another 50-odd years powered by electrification and the internal combustion engine. But the fourth industrial wave—launched in the early 1950s on the back of petrochemicals, electronics, computing and aerospace—petered out in the late 1980s, having lasted for little more than 35 years.

Why the sudden speeding up? Perhaps because companies had stopped leaving the process of innovation to chance. Starting with Bell Labs in 1925, corporate laboratories sprang up all over the place, allowing firms to search for new technologies in a systematic manner. On top of that, the analytical and computational tools that were developed boosted the productivity of research tremendously.

Then came the carousel that whirled so many high-tech firms along during the 1990s, before the ride came to its inevitable, if abrupt, end. Schumpeter's fifth wave started around 1989, following the widespread introduction of the client-server form of corporate networking. With “fat clients” (ie, networks of personal computers stuffed with memory and processing power) on two desks out of three, the industrial world was ready to embrace the fledgling Internet and the torrent of innovation in software, multimedia and telecoms that ensued.

Schumpeter's fifth industrial wave is far from over. It will probably run for 20-25 years all told, handing over to the next technological upswing around 2010-15. So what was that ghastly Nasdaq crash in April 2000—and the subsequent evaporation of venture-capital funds—all about? Nothing more than the crunch of gears as the present cycle came to the end of its easy upswing phase and dropped a cog ready for its plodding second phase.

Same old cycle, just faster

For two centuries, each new surge of economic activity has come in three distinct phases. The first phase

was a heady upswing as successful participants—in cotton, railways, motor cars, electrical goods, petrochemicals or whatever was the technological driver of the day—enjoyed fat margins, set standards, killed off weaker rivals and established themselves as leaders of the pack (today, think of Cisco, Intel and Microsoft). Then came the second phase as the market matured and the dominant firms hunkered down for slower growth. The final phase, a short and sharp decline, occurred when a whole new set of technologies started jostling for the attention of investors.

It is still too early to say what combination of new technologies will unleash the world's next great surge of economic activity. But they will doubtless build on the previous wave's successes—just as they have done before. The Internet, for instance, was simply a more advanced version of the store-and-forward concept pioneered by telegraphy.

TQ would like to hear from readers what they think the technologies for the next wave will be and why (comments, please, to letters@economist.com). All being well, a selection of the most compelling arguments will be published in the next issue.

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MONITOR

Tapping the ether

Sep 20th 2001
From The Economist print edition

Wireless networking may be fast, cheap and convenient, but it is wide open to anybody who wants to eavesdrop

THE vigour with which the Internet has been embraced leaves little doubt that network connectivity is a good thing. It is therefore no surprise that wireless networks have become popular in a short period of time. This new type of networking—formally known as 802.11b but usually referred to as wireless Ethernet, AirPort or Wi-Fi—has taken the corporate world by storm, infiltrated even small offices and homes, and is showing up in hotels, airports and Starbucks coffee shops.

Wireless Ethernet offers considerable savings because it avoids the cost of running wiring into every room. With an 802.11b-equipped computer, you just need to be in range of a so-called “access point” (base station) which connects the wireless network to a wired one. People with wirelessly attached laptops are free to wander about the building, even venture outside, without forgoing their network connections.

Unlike the much-hyped Bluetooth, which is designed to be a wireless replacement for relatively short cables, 802.11b is an eminently useful wireless data networking standard. But its Achilles heel is a glaring lack of security. In the two years since Apple introduced a cheap form of wireless Ethernet called AirPort, 802.11b's growing popularity has brought it to the attention of both hackers and security researchers. As a result, 802.11b's security has been shown to be more a placebo than a proper form of protection.

The first problem is that most users do not even enable the basic security measures that are built in to 802.11b. Reports of outsiders tapping into corporate networks from the street below are legion. But even those who enable all available security features are being lulled into a false sense of security.

Wired Equivalent Privacy (WEP) is 802.11b's current security scheme, and is intended to provide two kinds of protection. It is supposed to thwart eavesdropping as information flies through the ether. It is also supposed to prevent unauthorised devices from using an access point to gain admission to the wired part of its network. As its name suggests, WEP purports to provide the same level of security as a wired network would. However, breaking into a wireless network that spills outside the building is far easier than breaking into a building itself to tap into a wired network. Apart from being illegal, accessing a wired network inside a building is obviously much more inconvenient than sitting in the car park within range of an access point.

WEP's locks do not provide nearly the hurdle to miscreants that users have been led to believe

Few people other than locksmiths care about how locks actually work, as long as they do their job. Unfortunately, WEP's locks do not provide nearly the hurdle to miscreants that users have been led to believe. This is because the techniques used to construct the WEP system were put together in a haphazard fashion. The encryption scheme used by WEP, called RC4, is secure when used correctly and has survived the test of time on the Internet. Indeed, web browsers include SSL (secure sockets layer), which is based on RC4, to protect their connections. In the case of WEP, however, RC4 is used inappropriately—rather like trying to put a tractor engine in a bus just because it is also an internal combustion engine.

In a well-designed cryptographic system, the length in binary digits (“bits”) of the encryption key determines how much effort is required to break the system. A 40-bit key length, for example, means

that the key can have one of 2^{40} (ie, two multipled by itself 40 times) values. The only way to discover such a key should be via a brute-force attack, trying each possible key until the correct one is found. That said, WEP's standard 40-bit key length is woefully short compared with the 128-bit keys (ie, one of 2^{128} possible values) considered prudent today. But even that might not be enough.

Passive attack

Last October, an Intel researcher published a paper illuminating design flaws that cause 128-bit WEP keys to be only slightly more secure than their 40-bit siblings. In January, workers at the University of California, Berkeley, described how they were able to beat WEP without trying every key. A team at the University of Maryland then published a paper in March, systematically showing 802.11b's collection of security features to be ineffective. In early July, an employee of a security firm called @Stake disclosed yet another weakness in WEP's design.

The pièce de résistance, however, came in late July when a team from the Weizmann Institute in Israel and Cisco Systems in California announced that, unlike the previous findings, WEP's security could theoretically be broken via a so-called “passive attack”. Such an attack provides no clues that an intrusion has even occurred. In late August, a group at AT&T Laboratories in New Jersey proved the theory. Armed with off-the-shelf hardware and permission from the network administrator, an AT&T intern acquired the network's master password in a matter of hours. The AT&T group did not release the software code they had used, but knowing that it was possible motivated several developers to create their own programs to prove that the vulnerabilities could be exploited. The most prominent of these tools, AirSnort, was created by programmers at Cypher42, a software and security company based in St Cloud, Minnesota.

Most of 802.11b's access points require that the administrator specifies a single key, and then tells all the users of that access point what the key is. Use of such “static” keys makes it even easier for attackers to take advantage of WEP's vulnerability, since it is a nuisance to change the key and then have all the users change their settings. With everyone using the same key, there is plenty of traffic to capture and analyse. Key changes—if they happen at all—are few and far between. That means, once a static key is compromised, it tends to be useful for some time to come.

This weakness can be ameliorated by frequent key changes, which is precisely what products from companies such as Cisco do. This line of defence uses so-called “dynamic” keys, which are valid only for a short time, and can be assigned to a specific user as well. Increasing the number of keys used to encrypt traffic makes the attacker's life more difficult and reduces the time—and the amount of data—that an attacker gets to determine the key.

Unfortunately, current dynamic key solutions are proprietary. Until the relevant standards bodies agree on a new security scheme for 802.11b—unlikely before the end of 2001—the majority of wireless Ethernet users will remain vulnerable. And even when a new standard is chosen, it will take months until more secure products become available.

Until the relevant standards bodies agree on a new security scheme for 802.11b—unlikely before the end of 2001—the majority of wireless Ethernet users will remain vulnerable

The Wireless Ethernet Compatibility Alliance (WECA)—the industry group that champions the cause of 802.11b—behaves as if wireless Ethernet users are to blame if they rely on WEP for security, and should know to take additional precautions. Using SSL, for example, easily thwarts an AirSnort attack, but the majority of web traffic does not use SSL. Furthermore, WECA argues that if the information on a wireless network is sensitive, then the obvious thing to do is encrypt it by using a VPN (virtual private network). Finally, access points should be placed in front of—and not behind—a firewall to make sure that any wireless vulnerabilities do not compromise the wired network that really must be protected.

Such suggestions rather miss the point. Not only are they a tacit admission of the false sense of security engendered by WEP, but such measures are only feasible for corporations with well-staffed IT departments, and not viable for small-businesses and home users.

The rapid adoption of 802.11b provides some useful lessons. Foremost is that the security aspects of any new data-communications technology must be addressed early by engineers, rather than added as a bundle of technologies that look good but quickly fail when exposed to the forces of the real world. By the time a technology is well along the way to public acceptance, it is too late to discover that a crucial

part of the foundation is crumbling. There is no question that 802.11b can be made secure by replacing WEP. But this will not help all those who have already built their wireless networks—and depend on them for their livelihoods.

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MONITOR

How to see through walls

Sep 20th 2001
From The Economist print edition

Transparent concrete is encouraging architects to rethink how they design buildings

CONCRETE has been a high-tech material since Roman times, when it was discovered that adding volcanic ash to the mix allowed it to set under water. Similarly, the Romans knew that adding horsehair made concrete less liable to shrink while it hardened, and adding blood made it more frost-resistant. In modern times, researchers have added other materials to create concrete that is capable of conducting electricity. It heats up when a voltage is applied, making it possible to build runways and drives that clear themselves of snow. Bill Price of the University of Houston now has an ambitious plan to make concrete with an even more unusual property: he wants it to be transparent.

Dr Price first had the idea when he saw an architect's model of a concert hall made using translucent materials, so that the model's structure could be seen more easily. He started to wonder whether the actual concert hall could be built so that it resembled the translucent model. That meant finding a way to make concrete transparent.

That is not as crazy as it sounds. Technically, concrete is simply a mixture of three ingredients: big lumps of material called the coarse aggregate (such as gravel), smaller lumps called the fine aggregate (such as sand) and a binding agent, or cement, to glue it all together into a solid. So translucent concrete, in theory, should be fairly easy to make using bits of plastic or glass of various sizes, with some kind of transparent glue to act as a binding agent.

Since early this year, Dr Price has been experimenting with various recipes for translucent concrete, though he has yet to reveal his ingredients. Since concrete is often reinforced with steel rods, he has also looked at using transparent plastic rods for a similar purpose. Tests of his initial samples suggest that, structurally, translucent concrete is just as good as the traditional kind. But it would cost around five times as much.

Dr Price is also the first to admit that translucency is a far cry from transparency. His aim is to champion the idea in the hope that fully transparent concrete will eventually become possible. By discussing the notion of transparent concrete, he observes, he gets people thinking in new ways. “As soon as people encounter the term, even people who aren't architects or designers, they are full of desire, full of excitement,” he says. He has visions of cities that glow from within, and buildings whose windows need not be flat, rectangular panes, but can be arbitrary regions of transparency within flowing, curving walls.

As if the goal of transparent concrete were not already lofty enough, Dr Price has also decided that it should be possible to mix, transport and pour transparent concrete using existing equipment and techniques. At the moment, his translucent concrete has to be pre-cast, rather than poured on site. He is also keen for transparent concrete to be an environmentally friendly material that can be recycled—though that, too, seems a tall order.

So far, Dr Price's work has spread among architects largely by word of mouth. Architectural practices have been requesting information, and asking when translucent or transparent concrete will be commercially available. That is probably some years off, although Dr Price recently held preliminary discussions with a major concrete manufacturer. Meanwhile, he continues to refine his translucent concrete, and is now seeking approval for limited use of the material in a private house in San Antonio, Texas. For the time being, the future of his innovative material remains opaque.

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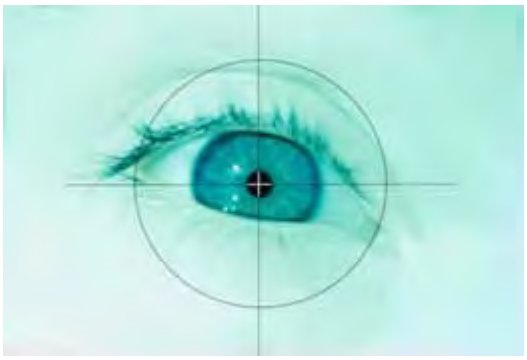
Visionary implant

Sep 20th 2001
From The Economist print edition

Although it is still early days, the first attempts to make an artificial retina—to restore sight to the blind—look remarkably promising



Bypassing a diseased retina to send images direct to the brain

SPECTACLES to aid the blind might seem the stuff of “Star Trek”, but research is in the works that could bring the notion down to earth. A number of groups in America are trying to perfect an “electric retina”, a device that might one day restore vision to millions of people who have lost their sight. To do this, they are calling on the same tricks that were used to create a successful cochlea implant—a device which, in response to sound waves, uses electrical impulses to stimulate nerve cells in the inner ear. These nerve cells fire, sending (slightly imperfect) signals to the brain, where they are interpreted as sound.

Even though researchers are not quite sure how the brain interprets the auditory signals as well as it does, they are now hoping that the same system will work for vision. In theory, an electric retina could function in a similar fashion as a cochlea implant. In healthy eyes, the retina is made up of cells that receive light and translate it into electrical impulses that are sent, via the optic nerve, to the brain. But in diseases such as macular degeneration (the leading cause of blindness in the western world) or *retinitis pigmentosa* (a hereditary disease causing blindness), the “rod” and “cone” cells that convert light into neural signals gradually degenerate.

Hence the attempts to use a set of tiny electrodes that bypass these cells and send their electrical impulses direct to the ganglion cells—the layer of retinal cells behind the rods and cones. The electrical stimulation should then prompt the ganglion cells to perform the task they are meant for: to transmit information to the optic nerve.

To do this, a tiny video camera, less than three centimetres square, is embedded in the frame of a pair of spectacles so as to capture the scene in front of the wearer. The camera's CCD (charge-coupled device) chip captures and digitises the images, which are then transmitted as radio waves to another, even smaller chip implanted inside the eye. The eye has a ribbon of 100 whispery electrodes attached to its rear. These transmit electrical impulses to the ganglion cells.

That, at least, is the idea. The reality, however, poses a number of engineering challenges. Second Sight of Valencia, California, is trying to harness the best of the academic research to create a device that people can actually use. Its prototypes draw on work done both at the University of Southern California (USC) in Los Angeles and a collaborative group from Harvard University and the Massachusetts Institute of Technology (MIT) in Cambridge, Massachusetts.

One of the biggest problems is finding a way to attach something to the retina's surface. The membrane is no more substantial than a piece of wet tissue paper. And any electrical device left in bodily fluids for long periods tends to corrode. But the hardest task of all is working out how to translate the visual images into electrical impulses that the brain can interpret properly.

As it turns out, the images that the camera records, even when broken down into picture elements (“pixels”), cannot be converted directly. Unfortunately, two electrodes stimulating two sites on a person's retina will not necessarily mean that the patient will see two spots. Deciphering this “neural coding” can be an arduous task. Mark Humayan, an ophthalmologist at USC, has shown that, with a short-term implant, a patient can recognise the letter “E” from five feet away. John Wyatt and Joseph Rizzo, co-

directors of the Harvard/MIT retinal implant project, have managed to help a patient see a line of four dots.

Hardly encouraging. But that they have been able to restore, even if only temporarily, a modicum of “sight” to people who had been blind for years is quite an achievement. Clearly, a better understanding will come once the group finds a way to keep an implant in the patient for weeks or even months, rather than just hours.

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MONITOR

Seeing is believing

Sep 20th 2001
From The Economist print edition

With twice the sharpness of previous screens, a new liquid-crystal display offers images that appear indistinguishable from the real thing

Sharper than the eye

IN A ditty for the stage, W.S. Gilbert once gave warning that "Things are seldom what they seem/Skim milk masquerades as cream." If appearances were tricky in 1878, they have just become trickier still. By doubling the resolution of existing liquid-crystal displays (LCDs), IBM has created a monitor which, when viewed from 18 inches away or farther, shows images that the human eye finds indistinguishable from the real thing.

The T220, as it is called, measures 22 inches across the diagonal, and displays 9.2m picture elements ("pixels"). That gives it a resolution of 200 pixels per inch, twice the previous state of the art. This achievement has come as a result of gradual improvements in optics, liquid-crystal chemistry and microelectronics made by IBM groups in Yamato, Japan, and Yorktown Heights, New York.

LCDs work by sandwiching a thin sheet of liquid crystals—in this case, thin-film transistors—between two narrowly separated panes of glass. Typically, small glass spheres have held the two panes of glass apart, impairing by refraction the performance of the display. IBM has replaced the spheres with small posts, which are located in the interstices between pixels, and so do not disturb the light as it leaves the excited liquid crystal. In the past, attempts to achieve such high pixel rates have been stymied by the build-up of electrical static, which caused problems with the brightness of the screens. The IBM groups have solved this by using a laser to scan back and forth across the glass, preventing the build up of static electricity.

At a current retail price of $22,000, the T220 is hardly going to be flying off the shelves. But it will be ideal for hospitals. Historically, radiology has been a driving force behind the development of high-resolution screens. And the T220's price tag will go almost unnoticed when attached to MRI (magnetic resonance imaging) or CT (computerised tomography) scanning machines. Until now, no monitor has been able to display the 5m pixels of data that a typical CT-scanning machine produces. The ability to reproduce the data with perfect fidelity should help radiologists make more accurate diagnoses from the computer screen.

According to Bob Artemenko, director of marketing and strategy for IBM's business display unit, the new screen could also help petroleum engineers to speed up their analysis of where to drill from one month to one day. Similarly, the higher fidelity will allow CAD (computer-aided design) systems, especially in the motor and aerospace industries, to work faster—because the detail revealed by the new monitor can cut out costly prototype-building exercises. IBM's idea is that the new monitor will allow designers of all sorts to go straight from computer image to final product, eliminating many costly and time-consuming middle stages.

With prices of more conventional 15-inch LCDs now below $500, IBM is expected to shift its engineering effort from achieving high resolution to lowering costs. How long before the T220 starts showing up in high-end laptops? Judging from previous experience, it could happen sooner than most people think.

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“Instant-on” magnetically

Sep 20th 2001
From The Economist print edition

Magnetic memory chips are poised to give traditional DRAMs a run for their money

HAULING yourself up by the bootstraps has never been easy. But computers do this every time they are turned on—hence the verb “to boot”. Booting a computer takes valuable time, compounded by the rebooting that is inevitably necessary whenever a computer freezes.

The reason that this process takes so long is that a computer's operating system must be loaded from its hard disk into its random-access memory (RAM) every time the machine is turned on. Unlike magnetic tapes or hard disks, RAM is an electric form of memory. It is, in effect, an array of tiny capacitors which, when charged, represent a binary “1” and, when not charged, represent a binary “0”. This has allowed them to be much faster than magnetic memory, in which the binary digits (“bits”) are represented by magnetically polarised regions rather than electric charges. The big problem with electric memory, however, is that it is volatile—the capacitors have to be recharged frequently so that they can continue to remember a “1”. When a computer is turned off, they lose all the data stored in them.

The race has been on to build nonvolatile high-speed memories that will allow computers to be turned on and off like televisions. Whichever technology wins is almost certain to be used in all new computers, so the stakes are high. Motorola, IBM, and Hewlett-Packard are all developing magnetic RAM (MRAM) which seems poised to become the non-volatile technology of choice. Both Motorola and IBM have announced plans to bring the technology to market within 18 months, advancing their initial target date of 2004. Besides turning instantly on, computers equipped with such chips would consume less power, making the technology ideal for satellites and portable gizmos.

MRAM works by etching a grid of criss-crossing wires on a chip in two layers—with the horizontal wires being placed just below the vertical wires. At each intersection, a “magnetic tunnel junction” (MTJ) is created that serves as a switch—and thus as a repository for a single bit of memory. The MTJ is essentially a small magnet whose direction is easily flipped. Common materials for the MTJ include chromium dioxide and iron-cobalt alloys.

Earlier this year, Motorola unveiled a prototype MRAM chip that stores 256 kilobits and has a cycle time for reading and writing data of less than 50 nanoseconds (billionths of a second). That puts it in the same league as conventional dynamic-RAM (DRAM) chips. IBM, collaborating with Germany's Infineon Technologies, has developed a one-megabit (million bit) MRAM chip at its laboratories in East Fishkill, New York.

There is still a long way to go before MRAM is ready for prime time. Neither IBM nor Motorola, for instance, is expected to go into mass production until they prove that they can make 256 megabit chips—the standard memory module used today. But, as total sales of computer memory in 2000 were estimated by Semico Research Corporation to have been worth $48 billion, manufacturers have a considerable incentive to ensure that MRAM becomes a serious challenger for DRAM's crown.

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More than skin deep

Sep 20th 2001
From The Economist print edition

Absorbing drugs gently through the skin beats injecting, swallowing or sniffing them

Friendlier way of getting a fix

THEY wax it, oil it, paint it and pamper it. And if some enterprising individuals have their way, people may use it extensively in future to deliver pills. This is not the family car, but the largest of human organs—the skin. It is also one of the more promising alternative vehicles for delivering doses of drugs to the body.

So-called “transdermal” technology is more popular than most people realise. Mention “the patch”, however, and people everywhere immediately recognise the importance of transdermal technology. But how far beyond nicotine can transdermal delivery go as a way of administering pharmaceuticals to patients?

Why should drug firms bother? Oral administration works reasonably well and has existed ever since humans first picked leaves off bushes and chewed them for their medicinal (or hallucinogenic) properties. But the ease of popping pills belies the years of research that it took to conquer the problems of reduced efficacy caused by the body's metabolism. A lot of effort has also gone into ensuring that orally administered drugs do not upset the stomach and continue to work hours after being swallowed.

Then there is intravenous injection of drugs. More recently, inhaling has become another alternative. But both have problems. Injection is highly invasive and feared by people who detest needles. Meanwhile, inhalation technology remains so new that effective mass adoption remains a long way off. By contrast, transdermal technology is non-invasive and does its job without causing stomach upset or being diminished by the body's metabolism. Even more important, patch technology allows drugs to be administered in a controlled fashion over time in a way that is more effective than swallowing time-release capsules.

Designed to prevent water loss, the skin works equally in reverse as a raincoat, doing a surprisingly effective job of stopping most foreign substances from entering the bloodstream. Although it absorbs to some extent, it rarely allows the deep penetration necessary for drug delivery. The reason for the skin's stubbornness is the *stratum corneum*, a superficial layer of fat that has evolved to resist permeation. Because this highly specialised layer is so effective, it takes extremely small chemical compounds, at unusually high dosages, along with special enhancement techniques, before a drug can penetrate the skin and be absorbed into the bloodstream.

The *stratum corneum* might be thought of as the world's toughest jelly. As such, the challenge facing researchers is to change the structure of this rubbery layer at local level. This means making its “colloidal” (amorphous and rubbery) structure more liquid-like—ie, changing it from a jelly into something resembling quicksand. When done locally, drug molecules of the right size and structure can slip past the *stratum corneum*, past the other skin layers and reach the blood stream, where a drug can do its stuff.

It sounds simple enough. But finding the right enhancement technique to drive the drug through the skin is a mixture of research plus trial and error. During the transdermal industry's age of leeching and cupping in the 1970s, a compound called dimethylsulfoxide (DMSO) was the enhancement agent of choice. Widely known as a universal solvent, DMSO is highly effective at permeating the skin and delivering a drug to the vascular system. Unfortunately, it is also highly effective at dissolving the skin,

causing discomfort and leaving unsightly sores.

Chemical enhancement has come a long way since then. Various essential oils, fatty acids, alcohols and other compounds have worked as transdermal enhancers. Electrical enhancement is also being pursued. One electrical technique that is attracting a lot of attention is “iontophoresis”. In this process, positively and negatively charged electrodes are embedded in a transdermal patch. The current flowing between them drives appropriately charged drugs through the skin, achieving acceptable levels of permeation. The technique's big brother, “electroporation”, uses short, high-voltage pulses to create more liquid-like pathways through the skin.

Whether the enhancement is done chemically or electrically, the real benefit of transdermal drugs lies in the provision of consistent doses needed to keep levels in the body steady. That makes transdermals ideal for people who need, say, hormone-replacement therapy (testosterone or estradiol), treatment for coronary conditions (nitroglycerine), or chronic pain relief (fentanyl). For such drugs, transdermal delivery is fast becoming the favoured solution.

The real benefit of transdermal drugs lies in the provision of consistent doses needed to keep levels in the body steady

Leading the field is Alza, a company based in Mountain View, California, that pioneered the nicotine patch. Recently acquired by Johnson & Johnson for $10.5 billion, Alza is expected to dominate the iontophoresis business with its E-TRANS delivery system. Rivals include Watson Pharmaceuticals of Corona, California, which acquired TheraTech in 1999 for its Androderm and Alora hormone-replacement systems and other transdermals.

Noven Technology of Miami, Florida, is also working on transdermals for hormone replacement in women. The company's patches are noted for being the smallest and most easily concealed in the business. Noven is now developing a transdermal system for treating “attention deficit hyperactivity disorder”—a condition that has worried parents into seeking advice these days.

More firms are rushing to meet the expected demand for painless, persistent transdermals. For good reason. Drug delivery is a $7.1 billion industry, and transdermal technology already accounts for $2 billion of annual sales. And that, proponents believe, is just the start.

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Safe keeping

Sep 20th 2001
From The Economist print edition

Digital archival repositories, swapping data Napster-style among themselves, could ensure that today's records are kept up-to-date and saved for future generations

THE sands of time may have left intact the stone-chiselled Egyptian hieroglyphics from 2000BC, but a portion of the original census reports of the United States of America for as recent a year as 1960—recorded on UNIVAC type II-A tapes—is now lost forever. Every day, important parts of the world's intellectual record vanish because of failures of the recording systems and media, the recording format becoming obsolete, or publishers who own the material going out of business, as well as the digital rewriting of history and the burning of digital records as political regimes come and go.

Hence all the effort now going into designing digital archival repositories (DARs) as a way of protecting digital information from corruption or destruction. The idea is to have a widely distributed network of independent repositories, connected via the Internet, that can make copies of each digital object stored in one another's archive and then spread them around to ensure that they are preserved.

To see how expensive this would be and to solve some of the uncertainties associated with preserving digital documents for centuries, Brian Cooper, Arturo Crespo and Hector Garcia-Molina at Stanford University are building the grand-daddy of all digital warehouses, the Stanford Archival Vault (SAV). In SAV, each digital object is assigned a numerical “handle” when added to a repository. A key property of the handle is that it is computed as a function of the bits of information in the object. Using this property, each object can be tracked in the network of repositories, since each replica of the object will have the same signature, and therefore the same handle. By design, deletions are simply not allowed, so digital objects are saved from ever being “burned” even if they fall out of favour with society.

Based on these properties, SAV offers what programmers call “application layers” that allow them to write software to help operate an archive. SAV also has a “view layer” which lets users define additional ways of looking at the DAR's underlying data. If necessary, these so-called “auxiliary structures” can also be stored in the SAV or simply deleted when no longer needed. Another SAV feature is its “reliability layer”, which ensures that the various mirror sites that store replicas of the data (say, the Library of Congress, Stanford Digital Library or Tokyo National Library) are complete and up-to-date.

While DARs are getting a good deal of attention, they are being used mostly for “data preservation” rather than retrieval and active research. This is analogous to preserving the stone-chiselled hieroglyphics on Egyptian obelisks in the British Museum. However, no Rosetta Stone is yet being constructed as a means for deciphering the data. Because of the linguistic issues involved, such “semantic preservation” is tough enough even if users know whether the data were written in ASCII, UTF-8, EBCDIC or some other digital code used for formatting data.

Perhaps the closest people have come to devising a Rosetta Stone for the digital world is XML (extensible markup language), which marks the data with tags that define the content in an agreed way and in a form that can be read easily by human beings. If the digital bits are preserved in SAV, and if their descriptive tags do not lose their meaning over time, digital pictures of man's first landing on the moon, records of the horrors of the second world war, and MP3s of “Yellow Submarine” could be preserved for future generations. How much people then will want to hear or see such things is another matter.

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No hiding place for anyone

Sep 20th 2001
From The Economist print edition

Embedded in bank notes or designer labels, the “mu-chip” can beep out the owner's location and details to marketers and thieves alike

IN TODAY'S information age, everybody leaves an electronic trail in their wake. With every credit-card purchase, ATM transaction, telephone call and Internet logon, they create an electronic portrait of themselves that grows clearer at every step. Perhaps the only items that are still untraceable are people's clothes, cash and day-to-day movements. But with the introduction of Hitachi's new “mu-chip”, even these could become common knowledge.

Chips in labels will tell retailers who bought what and where

The Hitachi chip is the world's smallest wireless identification device. It measures 0.4 millimetres square and is thin enough to be embedded in paper. It can hold only 128 bits of read-only memory, and do little more than spit out a unique identification number, when asked, to a distance of about 30 centimetres. It uses the same frequency band (2.45 gigahertz) as such longer-range wireless networking technologies as Bluetooth and 802.11b. But with the mu-chip's tiny size come some large implications.

Until now, size and production cost were the main obstacles that stopped companies from embedding identification chips in everyday items. But Hitachi has managed to create an integrated circuit that is not only tiny but cheap. The company expects a single chip to cost less than ¥20 (16 cents). Originally, the chip was built in an attempt to foil counterfeiters. It is small and thin enough to be woven into paper, and folding does not harm it. In combination with a bar-code reader, the chips can prove the authenticity of money or official documents, thwarting counterfeiters before they have even begun.

The chip has captured wide attention. The day after Hitachi unveiled it, Mu-Solutions, an in-house venture company founded in Tokyo to market the device, had more than 400 telephone enquiries. Mu-Solutions has now formed partnerships with some 40 companies around the world.

Ryo Imura, boss of Mu-Solutions, knows there is a large market out there—in everything from securities to retail sales. The Gap, a clothing chain for the young based in San Francisco, is interested in the chip for its marketing potential. The company wants to integrate the chip into its clothing labels, so that when a customer buys a pair of jeans, or a little black dress, that information will be sent straight to the company's database. Expensive brands, such as Gucci or Chanel, could use the chips to inhibit cheap imitations. Hospitals could use the chips as patient-identification tags.

The tiny Hitachi chip, however, could feed a number of privacy concerns. Although the chip now requires a separate machine to read it, future incarnations will doubtless be able to communicate wirelessly. Embedded in cash, central banks could monitor the flow of paper money, determining who has spent what and where—a function that credit cards already perform. Identity chips could even be embedded in valuables, so that they could be tracked in case of theft.

But the mu-chip is a Pandora's box, believes Lee Tien, an attorney at the Electronic Frontier Foundation (EEF), a San Francisco-based organisation that specialises in the conflict between technology and personal rights. Although he has no intention of demonising the Hitachi chip, it is nevertheless an example of how surveillance technology is getting cheaper all the time.

Overtones of Big Brother may not be the only problems. If tiny chips woven into money and other valuables were constantly announcing their whereabouts, a thief would know precisely which person or home to rob. By the same token, chips in clothing—linked to their owner's identity at the time of purchase—could mark the wearer's location anywhere on earth.

The EEF's Mr Tien points out that, by definition, privacy means not being watched, or known about, or listened to. These new chips may therefore constitute a direct infringement of personal privacy. Whether they are challenged—in much the same way as the Intel Pentium II processor's ID numbers were—remains to be seen. For now, Hitachi claims to be unconcerned. The chips will be available from the end of 2001, with annual sales forecast to reach $145m by 2005.

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TEAM SPIRIT

Agility counts

Sep 20th 2001
From The Economist print edition

In the latest of our series on managing innovation, we look at agile programming. This is the culmination of many faddish ideas for producing software more efficiently. But behind it lies a healthy emphasis on the virtues of teamwork in a business plagued with prima donnas

More productive in pairs

A COMMON cause of disaster in software development is that the end product is precisely what the customer originally ordered. In a world moving at Internet speed, a customer's objectives are constantly being revised, so programmers have to be able to hit a moving target. Is there any formula for coping with this sort of unpredictability? With this in mind, 17 leading software gurus holed up in a Utah ski resort last February to produce a "Manifesto for Agile Software Development". Portentous as it may sound, the manifesto represents the distillation of several successful team-oriented techniques, and should inspire innovation groups outside the confines of software development.

There is a long history of complex methodologies for structuring software-projects. Some seem as intricate and unfathomable as the lines of arcane code that programmers spend their lives writing. Indeed, some computer languages, such as the Unified Modelling Language (see article), have been developed specifically to help programmers do their jobs. But the punishing pace of web-based development has also given birth to a host of more flexible methodologies that deal with the real-world challenge of getting a bunch of wayward nerds to collaborate on getting a product out of the door.

Several of these methodologies were represented at the Utah meeting by their original developers or key proponents. One example is "Scrum", an approach to project management which focuses on the team that is working out what are the main roadblocks in a project. Feature Driven Development, another popular approach, contrasts with Scrum by defining the main features that a software product must have, prioritising them and then working doggedly through the list.

Extreme Programming (XP), currently the most popular methodology, uses techniques such as pair-programming, in which one person programs while a partner checks the result for bugs and makes sure that only essential code is produced. Another agile approach is embodied in a set of customised tools called "Crystal" which recognise from the outset that each project is unique, and depends on the size of the team and how critical the application is. Developing a web browser, for instance, is vastly different from writing a control system for a nuclear power plant. So development strategies need to reflect this.

Many other agile approaches exist, some so new they even lack names. Common to all is an increased emphasis on personal communication and programmer morale, rather than a reliance on careful documentation of written code that characterises traditional methodologies. While this ensures that a team spirit develops, it can infuriate the brilliant loners who like "to pull all-nighters" as they code software idiosyncratically in solitary confinement for 24 hours or more at a time. But a frustrated diva is considered a small price to pay for ensuring that the code remains relevant to the customer's changing needs.

Many other agile approaches exist. Common to all is an increased emphasis on personal communication and programmer morale

The customer as colleague

All the manifesto's signatories believe in rapid and frequent releases of partial solutions, so the customer

can react along the way to a final product. Indeed, a key feature of being agile is to integrate the customer into team discussions. What agile programmers do not believe in are “virtual teams” where programmers never meet face to face, or off-shore development where detailed product design is done in, say, France, and the nitty-gritty programming outsourced to India. Although such approaches can work for certain applications and may be cheaper, they work badly for complex, shifting tasks.

Some of the catch-phrases and jargon of the agile movement—“individuals and interactions over processes and tools” and “customer collaboration over contract negotiation”—are frowned on by more traditional programmers. However, hard evidence is mounting to support the anecdotal view that being agile is indeed smarter. Laurie Williams of the University of Utah in Salt Lake City has shown that paired programmers are only 15% slower than two independent individual programmers, but produce 15% fewer bugs. Since testing and debugging are often many times more costly than initial programming, this is an impressive result.

In some ways, the software world is a latecomer to the notion of a team-based innovation that is both extremely responsive and highly adaptive. Similar agile concepts have been around in manufacturing for years. Ironically, nothing in recent times has come as close to demanding total agility as the blistering pace of developing products for the Internet. The explanation may be that the rigorous, logical mindset of people who are used to communicating with computers is not fertile ground for the social values espoused by the agilists.

In some ways, the software world is a latecomer to the notion of a team-based innovation that is both extremely responsive and highly adaptive

If so, the manifesto's authors are determined to help spread the gospel. They have formed an “Agile Alliance” which, although little more than a loose network of believers for now, is already having an impact. The first proselytising articles by self-appointed agilists came out in the heavyweight software publications during the summer, and a follow-up meeting of the alliance is planned for October. Meanwhile, the first book on agile software development, written by Alistair Cockburn, who is one of the alliance members, should be in print by then.

All the elements of an intellectual bandwagon would seem to be in place. Those aboard the agile movement are insisting that it should not become another carved-in-stone methodology like XP. And while they agree on what makes good teamwork, they say there is—and always will be—plenty of room for differences of opinion about the tactics to be used. “The unifying objective,” they say, “is to avoid becoming a unified object.” In this, the agilists are, at least, moving in their own nimble and flexible way.

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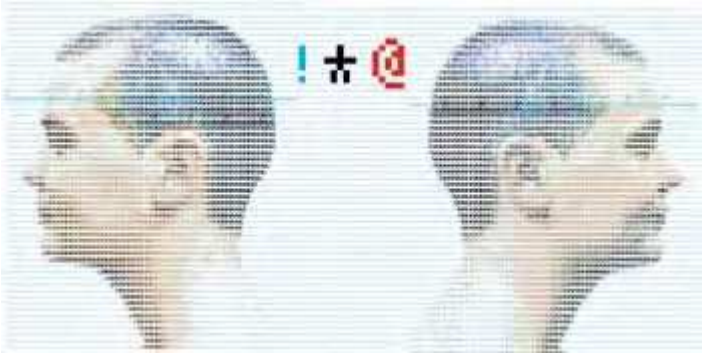
REPORT: PROGRAMMING

A lingua franca for the Internet

Sep 20th 2001
From The Economist print edition



Far from producing a universal programming language, the Internet is encouraging a proliferation of new ones. Whichever language, Java or C#, wins today's battle for the hearts and minds of programmers, the business of writing software is becoming steadily easier

WALK into any big bookshop, and chances are that you will find a whole floor devoted to weighty tomes with titles such as “UML in a Nutshell” or “Programming Python”. These books teach programming languages and related software tools. With their mind-numbing use of acronyms, they are not exactly a pleasure to read. But mastery of a programming language is a step along the road to success for many a whiz-kid with Internet ambitions.

Of all these languages, Java makes the most headlines. It has become synonymous with programming for the World Wide Web. Java has rocketed to fame since it was launched in 1995 by Sun Microsystems, the leading maker of computer workstations, in large part because of its promise of “write once, run everywhere”.

The development of Java is a case of corporate serendipity. Bill Joy, now a vice-president at Sun Microsystems, thought up the idea of a programming language that would be optimised for electronic gizmos, and thus easily transportable from one microprocessor to another. The project stuttered on at Sun until 1994, when Mr Joy and a team of researchers redirected the technology towards Internet applications. A year later, Netscape was incorporating Java in its browser.

But Java has become a household word for other reasons. The language has played a key role in the protracted legal battle between Microsoft and the American government's trust-busters. Sun Microsystems was a hostile witness in Microsoft's antitrust trial. So it came as no surprise when Microsoft launched a new programming language a year ago called C# (pronounced “C-sharp”).

Escalating the dispute, Microsoft is due to release its new operating system, Windows XP, on September 24th, with a four-year-old version of the code needed to run Java programs that makes that language seem decidedly clunky. Ever since it got wind of Microsoft's devious stunt, Sun has been racing to produce a piece of software that users can load into their computers so that Windows XP can take full advantage of Java's latest improvements.

News of these technological punch-ups is read assiduously by the financial crowd as well as the programmers. For, behind the headlines, a big linguistic upheaval is under way. On the surface, the changes may seem glacial. But deep within the arcane world of programming semantics, differences of opinion are hotting up. Their eruption will change the landscape of the Internet, and much else, for the better. The battle between Java and C# for the hearts and minds of programmers is just the beginning.

Generation gap

The plethora of modern programming languages has a common evolutionary background. With each new generation, programming languages have tended to become more abstract and remote from the computer that they communicate with. First-generation languages talked to the computer in the ones and zeros of “machine code”, which was interpreted directly by its central processor as instructions for manipulating data stored in its memory. The second-generation, or “assembly”, languages were devised to make the task of writing and reading such instructions easier, by using a code composed of letters and numbers, which was subsequently translated into the 1s and 0s that the machine could comprehend.

Third-generation languages, such as C, Pascal and Fortran, consist of English words such as READ, WRITE, and GOTO as well as mathematical symbols. Unlike first- and second-generation languages, the syntax (ie, the rules for combining symbols and words) of third-generation languages is in principle independent of the computer they run on. A separate program called a compiler is used to translate the code into machine language.

A further abstraction is achieved in fourth-generation languages such as SQL (Structured Query Language), a programming language for querying databases, or Mathematica and MathCad, languages for performing advanced mathematical manipulations and solving scientific problems. These languages also offer the programmer a far more natural form of expression, but at the expense of considerably narrowing the range of problems that the language can tackle.

When it came to developing a fifth generation of computer languages, this orderly evolution fizzled out. The Japanese government's Fifth-Generation Computer project—aimed at marrying artificial intelligence techniques with programming—was abandoned in 1992, with little to show for ten years of research and billions of yen. The Japanese policymakers did not foresee the rise of the Internet and the need for an entirely different approach.

What the Internet has done, in effect, is to place the priority on the programmer, rather than the language. The elegance of computer languages—so dear to academic software gurus—has been sacrificed for ease of use. That is what matters to people who are building web applications on a tight schedule. Hence the rise over the past decade of the quick-and-dirty scripting languages—the “sticky tape” of the World Wide Web.

These languages rose to prominence largely because they are so flexible and adaptable to the needs of the Internet. Examples include Perl, a language that can be used to communicate between a web server and its clients, and Python, a language used, among other things, for managing discussion forums on the Internet. Other examples with more awkward names include Tcl/Tk, awk and C Shell. There is even a scripting language called JavaScript—a clever marketing ploy, since it is linguistically unrelated to Java.

“A language that incorporates concepts from artificial intelligence will appear when the time is ripe—and leave Java and C# by the wayside.”

In many ways, scripting languages take the idea of fourth-generation languages a step further in the direction of simplicity. They are known as “interpreted” languages. That is to say, the computer interprets the programmer's wishes one instruction at a time, rather than having first to “compile” or translate the whole program before it can run. Writing interpreted programs is a bit like dashing off rhyming couplets. By comparison, writing compiled programs is more like composing a sonnet.

That makes scripting languages ideal for quick-fix solutions rather than mammoth projects. Also, scripting languages can put up with a considerable amount of ambiguity in the way they are written—that is, they are “weakly typed” in computer-speak. A “strongly typed” language such as Java will revolt at the slightest deviation from its standard way of doing things. Above all, scripting languages are designed to act as go-betweens for other programs, rather than as stand-alone units. This glue-like function is what makes them so attractive for web applications, in which communication between programs is vital.

Object lesson

Another trend, which predates the web, but was greatly stimulated by it, is the shift to “object-oriented” programming. The objects in question tend to be convenient representations in computer code of counterparts in the real world. For example, a clickable button on a web page is an object. The programmer can change the object through a limited set of methods, which will be the same for all clickable buttons. This contrasts with so-called “procedural” languages such as Fortran and C, which focus on how to do things such as draw a button on the screen, and require the programmer to reinvent the button each time a fresh program is written. As the button example suggests, objects are particularly well-suited to “graphical user interfaces”—the friendly desktops that Windows and the World Wide Web present to users.

The price to pay for objects is that the language must come equipped with a large library of different classes of objects, making the language bulkier and more cumbersome to use. In some versions of the pioneering object-oriented language, Smalltalk, libraries can contain many thousands of object classes. Still, the consensus is that the benefits of having to store a library of objects far outweigh the costs—especially nowadays, with processing power and memory storage having become so abundant and cheap. In exceptional cases, where size is an issue, libraries can be pared to a minimum. Java, which is object-oriented, now comes in a pint-size version that fits on a “smart card”, a credit card with a chip embedded into it for encrypting data in mobile phones and other portable devices.

Another advantage of object-oriented programming is that groups of users (eg, retailers, estate agents, doctors) can create and share new classes of object. This makes object-oriented programming particularly suited to the group-based nature of the web.

It is no surprise that just about every programming language that was not object-oriented has now become so. Delphi is an object-oriented version of Pascal, once the favourite language for teaching computer science. An object-oriented extension to the no-frills Basic, the favourite language of amateur programmers, underlies Visual Basic—a favourite nowadays for developing simple graphical user interfaces in Windows. Visual Basic is reckoned to be used by 6m developers—twice as many as Java. Even the old-fashioned programming language for business, Cobol, has been revamped as OOCobol.

Meanwhile, the philosophy behind object-oriented programming is itself moving to higher levels of abstraction. A relatively new, and fashionable, extension of the concept is the so-called “software pattern”, which captures the essential structure of a successful solution to a recurring problem in software development. Patterns are to objects much as prefabs (factory-built houses) are to bricks and mortar.

Environment friendly

While scripting and object-oriented programming represent significant new trends, the biggest shift in the past decade has been in the definition of what a programming language actually is. The success of Java and the high hopes that Microsoft is pinning on C# have little to do with the languages themselves (both are really just variations of C++, an object-oriented version of C). What matters most for the success of these languages is that they are embedded in an Internet-friendly software environment.

One of the attractions of Java's environment is a program called the Java Virtual Machine (JVM). Java programs are first compiled into Java byte code, an intermediate language which, unlike machine code, is not computer specific. Applets, which are a type of application written in Java, can be run in their byte code form by the JVM, which works on any computer that has a small piece of software called a “run-time environment” loaded to act as an interpreter. This two-step translation process—first compiling locally for the JVM, and then interpreting on a remote computer—is what has made Java so popular on an Internet that is home to a multitude of “platforms”, ranging from Windows PCs and Macintoshes to Linux and Unix boxes of every type and description.

Nifty as it is, however, Java does not always live up to its promise of being computer agnostic. “Write once, debug everywhere” is how cynics describe it. Lately, a number of new twists have been added to the Java environment to make it more effective. For example, “just-in-time” compilers ensure that an applet, once translated into machine code, can bypass the byte code on subsequent occasions. This is why features on a web page often respond slowly to the first click, but faster thereafter. The effect of such developments is that the boundary between “Java-the-language” and “Java-the-environment” is slowly but surely being blurred.

“The battle between Java and C# for the hearts and minds of programmers is just the beginning.”

Making a difference

The strength of the Java platform has earned it the backing of many other companies besides Sun, the most important being IBM. Microsoft is doing its best to make inroads into this captive market. There is no question that C# has an excellent pedigree as a language: Anders Hejlsberg, head of the team that developed C#, was also the man behind Delphi. Like Java, C# is deeply integrated into its environment—in this case, the .NET environment that Microsoft is at present promoting avidly.

A particular strength of this environment for C# is RAD (rapid application development), a concept originally developed by Mr Hejlsberg in connection with Delphi. RAD is all about putting handy, pedagogical tools within a mouse-click of the program's developer, making it easier for beginners to learn the language, and also quicker for professionals to write demanding applications. Support for RAD is just one example of how the C# language and the .NET environment are intimately linked. Sun has responded to Microsoft's emphasis on a programming environment by formally giving the Java environment the name ONE (open net environment).

Of course, winning the loyalty of young programmers requires more than just clever software. As part of its charm offensive, Microsoft will provide the language free to students in a package called VS.NET Academic, which is scheduled to be released later this year. Indeed, in a manner most unlike the hard-nosed Microsoft of old, the company aims to have C# recognised as a standard available free next year through the European Computer Manufacturers Association, an internationally recognised standard setter.

As the battle between C# and Java rages in the student dormitories, the struggle will continue on a rather more conceptual level on the web. Conceptually, the two languages represent wholly different bets on the future of the Internet. Mr Hejlsberg, not one to mince his words, is emphatic that the Internet is about data transfer and not data processing. Where Java's philosophy is based on moving applets around the Internet—which, for many, is disturbingly similar to creating computer viruses—C# focuses much more on moving information. This is one of the reasons why Microsoft has embraced XML (extensible mark-up language) as an open standard for data transfer on the web.

Although XML is a language, it is not a programming language. For one thing, it cannot perform mathematical or logical manipulation of data. Rather it is, as the “X” in its name implies, an extremely flexible definition of how data should be transferred over the Internet. In this, XML contrasts with HTML (hypertext mark-up language), the most popular protocol for data transfer on the web today, which is seen by the cognoscenti as far too limited in scope for the future of the Internet. Of course, Microsoft is not alone in implementing the freely available XML standard. Indeed, XML is already widely used in combination with Java programs. But C# has the marked advantage of being developed with XML in mind, rather than as an afterthought.

Beyond imperatives

Although Java and C# are reshaping the nature of programming languages, at a more fundamental level there has been surprisingly little change in the past two decades in the way that programmers express themselves. What Java and C# share in common with distant ancestors such as Fortran and Algol is that they are “imperative languages”. The programmer issues instructions to the computer in much the same way as the foreman at a building site shouts at his workers. Yet a higher degree of abstraction clearly exists—for instance, architects spend their time designing the building rather than issuing orders.

Perhaps the closest thing today to a language that expresses the architecture of a program is UML (unified modelling language). UML was introduced in 1996 by Grady Booch, James Rumbaugh and Ivar Jacobson, who founded Rational Software of Cupertino, California, to exploit their invention. Originally, UML was conceived as a way of standardising existing tools used to design computer programs. It is a “big picture” modelling language, and it has been embraced by many computer programmers, even though it is not restricted to programming.

UML allows the programmer to “declare” the desired state of a software application, mapping out relationships between different classes of objects. Tools associated with UML then help programmers to generate code in an object-oriented language such as Java. So far, these tools do not translate directly

into a complete working program. Programmers still have to fill in many blanks themselves, and some cynics scoff that UML is just fancy flow charts.

Nerds who measure success in terms of lines of written code are unlikely to be sympathetic to such a new way of developing programs. It will take a generation of youngsters, raised on the likes of UML, before such “declarative” languages pose a significant threat to “imperative” ones. However, a generation change can happen awfully fast in the Internet age, as the switch to Java has shown. At a conference on UML applications in Genoa this spring, the buzz in the coffee breaks was about industrial programmers completing major software development projects using just UML and related tools—without recourse to programming in more conventional languages.

“As the clash between C# and Java shows, a huge amount is at stake. Expect to see a whole alphabet soup of new languages in the next decade.”

Thinking man's language

On the horizon, programming languages face the daunting challenge of helping to turn the Internet into a more intelligent place. A year ago, Tim Berners-Lee, the inventor of the World Wide Web, published a manifesto for a semantic web. His vision is that computers should be able to recognise the meaning of information on the web by its context, and provide users with much more relevant information than web browsers now do.

There are many ways that this could happen. Certainly, some of the semantic information can lie in the data itself. XML helps to do this. And a standard known as RDF (resource description framework) defines how to encode some semantic meaning into XML—for instance, whether one object (say, a person) has a relationship (eg, owns) with another (say, a car). Helpful as RDF and related standards will be in building a web endowed with more meaning, some kind of artificial intelligence programs will be needed to understand context as humans do.

Although such programs can no doubt be constructed in Java or C#, these languages were not designed for such purposes. Herein lies an opportunity for languages designed with artificial intelligence specifically in mind. Such languages have existed for decades. The so-called functional language Lisp computes with symbolic expressions rather than numbers; the logical language Prolog works by making logical statements about objects.

Lisp and Prolog still have a loyal following in research circles, but their impact elsewhere has been modest. Languages such as Java have proved to be the fittest, in a Darwinian sense, because the Internet dictated that the big programming challenge was not one of artificial intelligence, but one of data manipulation, visualisation and communication between programs. As in Darwin's theory, the definition of what is fittest depends on the environment, which is constantly changing. Even though Lisp and Prolog may not be the shape of things to come, a programming language that incorporates concepts from artificial intelligence will no doubt appear when the time is ripe—and leave the likes of Java and C# by the wayside.

How fast could all this happen? Although the .NET platform required a massive effort on the part of Microsoft, the language C# was developed by a team of four researchers in a mere two years, with a similar-sized effort producing the compiler. It is thus within the realms of a small start-up's aspirations to develop the Java language for the next generation of the web, and to rely on open-source methods to generate the necessary environment. As the clash between C# and Java shows, there is a huge amount at stake in setting the trend for programming languages. Expect a whole alphabet soup of new languages within the next decade.

Programmer's progress

High school student:

```
10 PRINT "HELLO WORLD"
20 END
```

First year undergraduate:

```
program Hello(input, output)
 begin
  writeln('Hello World');
 end.
```

Final year undergraduate:

```
(defun hello
  (print
   (cons 'Hello (list 'World))))
```

New professional:

```
#include
void main(void)
{
 char *message[] = {"Hello ", "World"};
 int i;
 for(i = 0; i < 2; ++i)
  printf("%s", message[i]);
 printf("\n");
}
```

Seasoned professional:

```
#include
#include
class string
 {
 private:
  int size;
  char *ptr;
 public:
  string() : size(0), ptr(new char('\0')) {}
  string(const string &s) : size(s.size)
  {
   ptr = new char[size + 1];
   strcpy(ptr, s.ptr);
  }
  ~string()
  {
   delete [] ptr;
  }
  friend ostream &operator <<(ostream &, const string &);
  string &operator=(const char *);
};
ostream &operator<<(ostream &stream, const string &s)
{
 return(stream << s.ptr);
}
string &string::operator=(const char *chrs)
{
 if (this != &chrs)
 {
```

Master programmer:

```
[
uuid(2573F8F4-CFEE-101A-9A9F-00AA00342820)
]
library LHello
{
  // bring in the master library
  importlib("actimp.tlb");
  importlib("actexp.tlb");
  // bring in my interfaces
  #include "pshlo.idl"
  [
  uuid(2573F8F5-CFEE-101A-9A9F-00AA00342820)
  ]
  cotype THello
 {
interface IHello;
interface IPersistFile;
 };
};
[
exe,
uuid(2573F890-CFEE-101A-9A9F-00AA00342820)
]
module CHelloLib
{
  // some code related header files
  importheader(<);
  importheader(<);
  importheader(<);
  importheader("pshlo.h");
  importheader("shlo.hxx");
  importheader("mycls.hxx");
  // needed typelibs
  importlib("actimp.tlb");
  importlib("actexp.tlb");
  importlib("thlo.tlb");
  [
  uuid(2573F891-CFEE-101A-9A9F-00AA00342820),
  aggregatable
  ]
  coclass CHello
 {
 cotype THello;
 };
};
#include "ipfix.hxx"
extern HANDLE hEvent;
class CHello : public CHelloBase
{
public:
  IPFIX(CLSID_CHello);
  CHello(IUnknown *pUnk);
  ~CHello();
  HRESULT  __stdcall PrintSz(LPWSTR pwszString);
private:
  static int cObjRef;
};
#include
#include
```

```
    ULONG ulCnt;
 IMoniker * pmk;
WCHAR wcsT[_MAX_PATH];
 WCHAR wcsPath[2 * _MAX_PATH];
 // get object path
 wcsPath[0] = '\0';
 wcsT[0] = '\0';
 if( argc > 1) {
   mbstowcs(wcsPath, argv[1], strlen(argv[1]) + 1);
   wcsupr(wcsPath);
   }
 else {
   fprintf(stderr, "Object path must be specified\n");
   return(1);
   }
 // get print string
 if(argc > 2)
   mbstowcs(wcsT, argv[2], strlen(argv[2]) + 1);
 else
   wcscpy(wcsT, L"Hello World");
 printf("Linking to object %ws\n", wcsPath);
 printf("Text String %ws\n", wcsT);
 // Initialize the OLE libraries
 hRslt = CoInitializeEx(NULL, COINIT_MULTITHREADED);
 if(SUCCEEDED(hRslt)) {
   hRslt = CreateFileMoniker(wcsPath, &pmk);
   if(SUCCEEDED(hRslt))
 hRslt = BindMoniker(pmk, 0, IID_IHello, (void **)&pHello);
   if(SUCCEEDED(hRslt)) {
 // print a string out
 pHello->PrintSz(wcsT);
 Sleep(2000);
 ulCnt = pHello->Release();
 }
   else
 printf("Failure to connect, status: %lx", hRslt);
   // Tell OLE we are going away.
   CoUninitialize();
   }
 return(0);
}
```

Apprentice hacker:

```
#!/usr/local/bin/perl
$msg="Hello, world.\n";
if ($#ARGV >= 0) {
 while(defined($arg=shift(@ARGV))) {
  $outfilename = $arg;
  open(FILE, ">" . $outfilename) || die "Can't write $arg: $!\n";
  print (FILE $msg);
  close(FILE) || die "Can't close $arg: $!\n";
 }
} else {
 print ($msg);
}
```

Experienced hacker:

```
#include
#define S "Hello, World\n"
main(){exit(printf(S) == strlen(S) ? 0 : 1);}
```

Seasoned hacker:

```
% cc -o a.out ~/src/misc/hw/hw.c
% a.out
```

Guru hacker:

```
% cat
Hello, world.
^D
```

Ultra high level programmer:

```
system.uhdl :
SYSTEM
 CREATE ScreenWin
  SIZE 20000000/Unit=One
  DESTINATION Order.dest[One]
  OUTPUT CHARACTER['Hello world']
 END
END
```

New manager:

```
10 PRINT "HELLO WORLD"
20 END
```

Middle manager:

```
mail -s "Hello, world." bob@b12
Bob, could you please write me a program that prints
"Hello, world."? I need it by tomorrow.
^D
```

Senior manager:

```
% zmail all
I need a "Hello, world." program by this afternoon.
```

Chief executive:

```
% message
message: Command not found
% pm
pm: Command not found
% letter
letter: Command not found.
% mail
To: ^X ^F ^C
help mail
help: Command not found.
>what
what: Command not found
>need help
need: Command not found
damn!
!: Event unrecognized
>exit
exit: Unknown
>quit
%
% logout
```

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REPORT: SPACE TECHNOLOGY

A bigger role for small satellites?

Sep 20th 2001
From The Economist print edition

Certain types of satellites have started to shrink in size, cost and development time, making it possible for communities, companies, schools, hospitals—and, perhaps one day, even individuals—to have a satellite of their own

IN 1957, the Soviet Union launched the first artificial satellite, Sputnik I. It weighed a little over 80 kilograms and was no bigger than a basketball. Ever since, satellites have grown heavier, larger and more complicated—and most now tend to weigh in at three to four tonnes. These huge craft do a great deal more than merely beep, as Sputnik did. But with each kilogram costing about $10,000 to put into orbit, it is somewhat curious that satellites have not shrunk in size, weight and price as have so many other high-tech products.

The past decade saw a mushrooming of interest in getting easy access to space using cheap and cheerful space missions. With their rapidly rising number of orbital experiments and applications, engineers became frustrated by the limited number of opportunities to fly their packages aboard the handful of launches a year of the Space Shuttle and other spacecraft. Meanwhile, the armed forces were tinkering with small, autonomously-controlled satellites for manoeuvring up to other satellites—to inspect, service or even, if necessary, destroy them. By all accounts, the age of the micro-satellite, even perhaps the personal satellite, was about to dawn.

However, much of the enthusiasm for micro-spacecraft fizzled with the failure of several high-profile endeavours—most notably the Motorola-led space-based cellular-phone consortium, Iridium, with its constellation of smallish satellites in low-earth orbit. But even if Iridium had succeeded, the micro-satellite business would probably still have failed to get far off the ground. Outside a few niche applications, the manufacturers failed to make an economic case for miniature spacecraft in any of the four main parts of the satellite market—communications, remote sensing, weather forecasting and space science.

That probably had more to do with poor business planning and execution than anything inherent in satellites that were small and cheap. David Bearden of The Aerospace Corporation in El Segundo, California, has made a study of NASA's successes and failures with small satellites. The ones that went awry, he found, were not too small but too complicated for the limited amount of money spent on them. So, in itself, small seems to be no bad thing in space.

“This kind of ‘Fordism' has created the tantalising promise of satellites that may cost less than $1m in the near future.”

Small minded

Today, a satellite is considered small if it weighs less than 500 kilograms, although many of the more innovative and functional small satellites weigh less than 100kg. Cost, of course, has been the main attraction of small satellites, as launchers needed to hoist them into orbit account for at least 30-40% of total expenses. Every kilogram saved in the payload's weight means a kilogram less thrust needed from the booster. That translates into a double saving—in fuel that has to be hauled along for the ride as well as in the airframe of the launch vehicle itself. The structural cost of an unmanned spacecraft runs to

around $5,000 per kilogram.

It is no surprise, then, that even makers of large commercial satellites for communications and broadcasting are trying to reduce the size of their components and subsystems. But for reasons that have more to do with the geosynchronous orbit they occupy—35,000km above the equator, where their orbital speed matches the speed of the earth's rotation and thus allows them to “hover” over a single spot—these heavyweights of the sky seem likely to get even heavier over the coming decade (see article).

Small satellites tend to use off-the-shelf parts and standardised platforms (much as car companies do) and are built on a cheap and simple assembly line. Commercial satellites, by contrast, are assembled painstakingly by hand, one at a time. And because the overall cost—and therefore the insurance premium to cover the risk of failure in launch or in orbit—is lower for a small satellite, customers are less likely to insist strictly on the use of the highest-quality parts made of materials that have been tracked for quality assurance purposes from the day they left the mine.

This approach frees small-satellite specialists such as AeroAstro of Herndon, Virginia, and Surrey Satellite Technology of Guildford, in Britain, from the ten-year development programmes that tend to hobble the makers of big commercial satellites. With their vastly shorter production cycles, makers of small satellites can thus take advantage of component improvements and price reductions as they become available. It is this kind of “Fordism” that has ushered in the $1m-15m satellite, squeezed production schedules to less than a year, and created the tantalising promise of satellites that may cost less than $1m in the near future.

Replacing a large, complicated satellite with an array of much smaller and cheaper ones also reduces the risk of a costly failure. If one or two small satellites in a distributed network fail, the others can be reprogrammed to pick up their workload until replacements can be launched. This “soft failure” mode of operation means lower risk, which, in turn, means cheaper insurance. Also, the greater number of satellites in the array translates into greater experience of operation—and hence greater reliability. That reduces insurance costs still further. After launch costs, insurance is the second largest expense in getting a satellite into orbit, accounting for as much as 15-20% of a mission's price tag.

David v Goliath

Advocates reckon that the main outlet for the present crop of small satellites is in applications that need highly focused, low-bandwidth communications. They point to the increasing number of machines—whether on the move, like ships, trucks and railcars, or stationary, like storage tanks, generating plant, oil pipelines or vending machines—that need to be tracked or monitored continuously. And this is not just in rich industrial countries. South Africa believes its small satellite programme will have commercial pay-offs in keeping tabs on its national assets.

ORBCOMM, a space technology firm based in Dulles, Virginia, provides such a global-tracking service through its network of 35 satellites, each weighing only 40kg and operating in a low-earth orbit to minimise launch costs, as well as the power needed for communicating with the ground. Last year, Volvo chose the system to extend its “On Call” rescue system, which allows motorists to call for help when their car breaks down. Robert Twiggs of Stanford University expects a large market to emerge for this kind of service if the price of the ground equipment can be made low enough.

This is what AeroAstro eventually hopes to do with its system of ten small satellites and one-way transmitters for beaming up their location, along with any other sensor data needed, such as temperature, pressure or engine-speed. The transmitters are no bigger than a pager and cost only $75. David Goldstein, AeroAstro's vice-president for business development, reckons that the entire system will cost about $65m, using satellites weighing between 30kg and 100kg. In July, AeroAstro started ground-based trials, tracking car park spaces, runway infrastructure, airport vehicles and noise-monitoring sensors over a 50km radius from Gulfport-Biloxi airport which serves the greater New Orleans and Alabama areas on the Mississippi coast.

Small satellites are also lowering the cost of being able to own and use space systems. When prices come

down to a few million dollars, they become affordable for, say, the agriculture ministry of a developing country. Equipped with remote sensing gear, they could be used to report on everything from deforestation and pollution to urbanisation. Using a handful of small satellites in a low-orbit array, agencies can do more active monitoring—such as keeping an eye on crops, forest fires and regional disasters. Surrey Satellite Technology has sold the technology to build small satellites to a dozen countries, including China, Pakistan, South Africa, Portugal, Turkey and Chile.

Surrey Satellite Technology is now putting together a system of five 100kg satellites to form a so-called Disaster Monitoring Constellation that will be shared by five countries. Algeria and Britain have already agreed to participate, and Nigeria, Thailand and China are expected to join shortly. For a total of $56m, the group will get something that will be functionally equivalent to, or even better than, an existing satellite that cost $300m.

A European Union group is looking at a similar approach, using nine low-cost satellites. The idea is to use advanced data-compression techniques on board the small satellites so that the signals beamed back to the ground can be handled by off-the-shelf receiving equipment. That way, local users should be able to receive the information directly, without having to wait and pay for it to be processed. This should allow them to make on-the-spot decisions.

However, it is not only developing countries that are taking advantage of low-cost satellite systems. So, too, are municipalities and even companies. AeroAstro has spoken to one group that wants to monitor water quality in Venice. As prices drop further, people as diverse as ranchers, property developers and universities are likely to find that owning their own small satellite becomes a serious proposition. Drug companies and others have already noted that growing perfect crystals in microgravity—too costly for commercial uses at International Space Station prices—would be a bargain once small satellites come down in price to $500,000 a pop.

Meanwhile, Team Encounter, with its Deep Space Probe scheduled for launch in 2003, plans to sell payload space to the public for $50 a package, allowing individuals to put small personal mementoes on a one-way voyage into outer space.

Small can be beautiful

It is clear that small satellites will remain a niche market for some years, but it is equally clear that they are here to stay—and that their prospects can only improve. Mr Goldstein of AeroAstro notes that the satellite market is fragmenting, with payloads getting both smaller and larger, and medium-sized craft being used less and less. It is worth remembering, however, that there is still no mass market for applications of low-earth orbit satellites, and that the business still has extremely high replacement costs.

The full potential of small satellites will be realised only when cheaper ways can be found to launch them. For the immediate future, the only solution is to improve the way that small satellites can hitch a ride on boosters carrying larger payloads into space. It makes no sense at this stage to develop a rocket expressly for small satellites, when the cheapest that would be able to deliver a payload into orbit would cost $25m. Launch costs would have to come down by a factor of ten to justify a dedicated booster.

Does that mean that small satellites will remain shackled to the launch schedules of conventional boosters as they hoist large commercial payloads into orbit? Perhaps not. Proponents argue that cannon-style launchings are a possibility, although considerable work remains to be done before it becomes practical to shoot small satellites into orbit.

“Team Encounter plans to sell payload space for $50 a package, allowing individuals to put the hair, ashes or whatever of their loved ones into space.”

Trials are under way with so-called “nano-satellites” (ie, spacecraft weighing less than a few kilograms). And, if everything goes according to plan, three years from now could see today's novelty experiments becoming a serious development programme.

Designers of small satellites also have high hopes for micro-electro-mechanical systems (MEMS). These silicon chip-like devices, fabricated with the help of etching and vapour deposition techniques borrowed from the semiconductor industry, combine a variety of sensing functions with the ability to activate microscopic levers, switches, valves and pumps carved into their innards. As such, they are true machines capable of performing mechanical work. The use of MEMS should lead to tiny radio-frequency transmitters and microscopic propulsion units and power

generators.

Such devices, says David Williamson of the United States Air Force Research Laboratories, could revolutionise the way in which satellites are designed and built. Besides reducing their size, weight and power consumption, the use of MEMS devices would give far better component integration (and hence greater efficiency) in areas such as propulsion, communication, data processing, power generation and navigation.

Unlike computers, satellites depend far more on mechanical systems than on digital ones—and they have thus benefited far less from the effects of the rule-of-thumb law about the inexorable shrinking of prices and increasing of capacity that was first propounded by Gordon Moore, one of the founders of Intel, decades ago. That could all change once MEMS-based propulsion systems and other components are ready to fly.

Then, there would be no stopping the small-satellite brigade. Like computers before them, prices of small satellites could be expected to tumble and performance to rise remorselessly as the market widened from government agencies to include companies and universities, and then wider still to include small communities and co-operatives, and finally to embrace even wealthy individuals. Twenty years ago, nobody could seriously have imagined owning a supercomputer of their own. Today, a third of all families in the industrial world have the functional equivalent in their living room. The arrival of the “personal satellite” could be every bit as dramatic as was the personal computer.

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Skyscrapers in the sky

Sep 20th 2001
From The Economist print edition

COMMUNICATIONS satellites will continue to get bigger for years to come. For one simple reason: they need more and more electrical power on board to transmit an ever-increasing number of communications and broadcasting channels to customers on the ground.

Paul Carr of Johns Hopkins University in Baltimore has worked closely with the satellite industry for years. He thinks that, although increasing the amount of electrical power on board a satellite is expensive, it pays huge dividends in terms of signal strength on the ground. That then allows suppliers of satellite-TV services to offer customers cheap little dishes that can be clamped to a balcony or roof instead of requiring half the back garden for a dish the size of a radio telescope.

But generating the extra power onboard the satellite, says Mr Carr, means installing bigger solar arrays, bigger batteries, bigger transmitters and bigger thermal radiators. That translates into more fuel being needed for the spacecraft, bigger reaction wheels to help stabilise it, heavier wiring all round, and a stronger airframe to carry it all.

Even if advances in miniaturisation allow the size of power-generating components to shrink, engineers still expect to see communications satellites that are parked in the crowded geo-synchronous orbit 35,000km above the equator get even heavier. In part, that is because manoeuvring them into such high orbits requires a lot of fuel.

It is also because of the restricted number of slots in this priceless bit of astronomical real estate. Once you have purchased one, you need to fit as much hardware as possible into it. While their diameter is restricted by the girth of the launch vehicle, geo-synchronous satellites are going to have ever more components packed inside them. All of which means that they will go on getting heavier rather than lighter.

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To infinity and beyond

Sep 20th 2001
From The Economist print edition

THE upside of being small is that it is possible to thumb a lift into space cheaply. The downside, as any hitch-hiker will tell you, is that you rarely end up precisely where you want to be. For small satellites, that means manoeuvring into the correct orbit from wherever they have been dumped. Hence all the effort that has gone into developing low-cost means of orbital propulsion.

AeroAstro of Herndon, Virginia, and Astronautics Technology of Malaysia are co-developing an orbital-transfer platform called SPORT. This is a rack designed to accommodate small satellites more efficiently within the spare capacity on board an Ariane 5 rocket. Because they cannot afford rockets of their own, small satellites have to hitch a ride on commercial launchers. SPORT could give them more launching opportunities.

Suitably packed together using a standardised racking system, bunches of small satellites might even begin to seem attractive primary payloads for some of the mainstream launching organisations.

Meanwhile, Surrey Satellite Technology of Guildford, Britain, is developing a rocket engine powered by hydrogen peroxide and polythene. But this is suitable only for intra-orbital manoeuvres.

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REPORT: ARTIFICIAL INTELLIGENCE

Machines with a human touch

Sep 20th 2001
From The Economist print edition

Instead of using the ones and zeros of digital electronics to simulate the way the brain functions, "neuromorphic" engineering relies on nature's biological short-cuts to make robots that are smaller, smarter and vastly more energy-efficient

PEOPLE have become accustomed to thinking of artificial intelligence and natural intelligence as being completely different—both in the way they work and in what they are made of. Artificial intelligence (AI) conjures up images of silicon chips in boxes, running software that has been written using human expertise as a guide. Natural intelligence gives the impression of "wetware"—cells interacting biologically with one another and with the environment, so that the whole organism can learn through experience. But that is not the only way to look at intelligence, as a group of electronics engineers, neuroscientists, roboticists and biologists demonstrated recently at a three-week workshop held in Telluride, Colorado.

What distinguished the group at Telluride was that they shared a wholly different vision of AI. Rather than write a computer program from the top down to simulate brain functions, such as object recognition or navigation, this new breed of "neuromorphic engineers" builds machines that work (it is thought) in the same way as the brain. Neuromorphic engineers look at brain structures such as the retina and the cortex, and then devise chips that contain neurons and a primitive rendition of brain chemistry. Also, unlike conventional AI, the intelligence of many neuromorphic systems comes from the physical properties of the analog devices that are used inside them, and not from the manipulation of 1s and 0s according to some modelling formula. In short, they are wholly analog machines, not digital ones.

The payoff for this "biological validity", comes in size, speed and low power consumption. Millions of years of evolution have allowed nature to come up with some extremely efficient ways of extracting information from the environment. Thus, good short-cuts are inherent in the neuromorphic approach.

At the same time, the electronic devices used to implement neuromorphic systems are crucial. Back in the 1940s, when computers were first starting to take shape, both analog and digital circuits were used. But the analog devices were eventually abandoned because most of the applications at the time needed equipment that was more flexible. Analog devices are notoriously difficult to design and reprogram. And while they are good at giving trends, they are poor at determining exact values.

In analog circuits, numbers are represented qualitatively: 0.5 reflecting, say, a voltage that has been halved by increasing the value of a resistor; 0.25 as a quarter the voltage following a further increase in resistance, etc. Such values can be added to give the right answer, but not exactly. It is like taking two identical chocolate bars, snapping both in half, and then swapping one half from each. It is unlikely that either of the bars will then be exactly the weight that the manufacturer delivered.

One of the contributions of the father of the field—Carver Mead, professor emeritus at the California Institute of Technology in Pasadena—was to show that this kind of precision was not important in neural systems, because the eventual output was not a number but a behaviour. The crucial thing, he argued, was that the response of the electronic circuits should be qualitatively similar to the structures they were supposed to be emulating. That way, each circuit of a few transistors and capacitors could "compute" its reaction (by simply responding as dictated by its own physical properties) instantly. To do the same thing, a digital computer would have to perform many operations and

"Neuromorphic engineers look at brain structures and then devise chips that contain neurons, axons, and a primitive

have enough logic gates (circuits that recognise a 1 or a 0) for the computation. That would make the device not only slow and power-hungry, but also huge and expensive. For a fuller account of Carver Mead and his unique contribution to the whole of information technology, see this article.

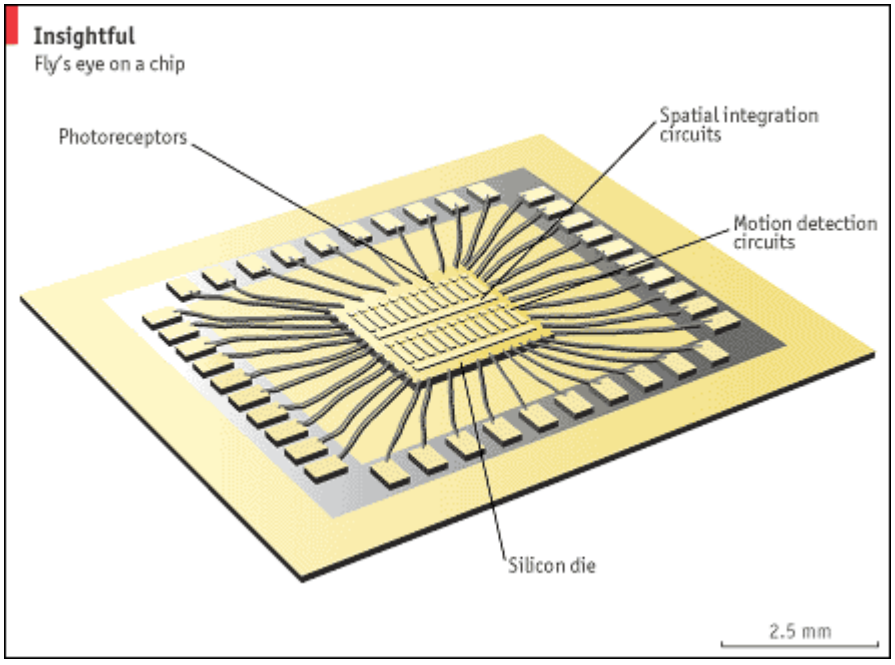
rendition of brain chemistry."

Another advantage of the analog approach is that, partly because of their speed, such systems are much better at using feedback than their digital counterparts. This allows neuromorphically designed machines to be far more responsive to their environment than conventional robots. In short, they are much more like the biological creatures they are seeking to emulate.

Going straight

One of the many projects demonstrating this concept at the Telluride meeting was a robot that could drive in straight lines—thanks to electronics modelled on the optic lobe in a fly's brain. The vision chip, built by Reid Harrison at the University of Utah in Salt Lake City, is a "pixellated" light sensor that reads an image using an array of individual cells, with additional circuitry built locally into each cell to process the incoming signals. The fact that these processing circuits are local and analog is crucial to the device's operation—and is a feature that is borrowed from the biological model.

Dr Harrison and his supervisor at Caltech and co-founder of the Telluride summer school, Christof Koch, identified the various processes taking place in the so-called lamina, medulla and lobular-plate cells in a fly's brain as being worth implementing in silicon. These cells form a system that allows the fly to detect motion throughout most of its visual field—letting the insect avoid obstacles and predators while compensating for its own motion.



In the chip, special filters cut out any constant or ambient illumination, as well as very high frequencies that can be the source of electronic noise in the system. The purpose is to let the device concentrate on what is actually changing. In a fly's brain, this filtering role is played by the lamina cells.

In a fly's medulla, adjacent photodetectors are paired together, a time delay is introduced between the signals, and the two are then multiplied together. The length of the delay is crucial, because it sets the speed of motion that the detector is looking for. In the chip, since the delay and the distance between the two adjacent photo-diodes are known, the speed of an image moving over the two detectors can be determined from the multiplier output. Large numbers of these "elementary motion detectors" are then added together in the final processing stage. This spatial integration, which is similar to that performed in a fly's large lobular plate cells, ensures that the broad sweep of the motion is measured, and not just local variations. The same kind of mechanism for detecting motion is seen in the brains of cats, monkeys and even humans.

To prove that the chip not only worked, but could be useful, Mr Harrison attached it to a robot that had

one of its wheels replaced by a larger-than-normal one, making it move in circles. When instructed to move in a straight line, feedback from the vision chip—as it computed the unexpected sideways motion of the scenery—was fed into the robot's drive mechanism, causing the larger wheel to compensate by turning more slowly. The result was a robot that could move in a straight line, thanks to a vision chip that consumed a mere five millionths of a watt of power.

For comparison, the imaging device on NASA's little Sojourner Rover that explored a few square metres of the Martian surface in 1997 consumed three-quarters of a watt—a sizeable fraction of the robot's total power. The image system that helps make the “Marble” trackball developed by Logitech of Fremont, California, a handy replacement for a conventional computer mouse, takes its cue likewise from a fly's vision system. In this case, the engineering was done mainly by the Swiss Centre for Electronics and Microtechnology in Neuchatel and Lausanne.

The concept of sensory feedback is a key part of another project shown at the Telluride workshop. In this case, a biologist, robotics engineer and analog-chip designer collaborated on a walking robot that used the principle of a “central pattern generator” (CPG)—a kind of flexible pacemaker that humans and other animals use for locomotion. (It is a chicken's CPG that allows it to continue running around after losing its head.) Unlike most conventional robots, CPG-based machines can learn to walk and avoid obstacles without an explicit map of their environment, or even their own bodies.

The biological model on which the walking robot is based was developed in part by Avis Cohen of the University of Maryland at College Park. Dr Cohen had been studying the way that neural activity in the spinal cord of the lamprey (an eel-shaped jawless fish) allowed it to move, with the sequential contraction of muscles propelling it forward in a wave motion. The findings helped her develop a CPG model that treated the different spinal segments as individual oscillators that are coupled together to produce an overall pattern of activity. Tony Lewis, president and chief executive of Iguana Robotics in Mahomet, Illinois, developed this CPG model further, using it as the basis for controlling artificial creatures.

In the walking robot, the body is mainly a small pair of legs (the whole thing is just 14cm tall) driven at the hip; the knees are left to move freely, swinging forward under their own momentum like pendulums until they hit a stop when the leg is straight. To make the robot walk, the hips are driven forwards and backwards by “spikes” (bursts) of electrical energy triggered by the CPG. This robot has sensors that let it feel and respond to the ground and its own body. Because outputs from these sensors are fed directly back to the CPG, the robot can literally learn to walk.

The CPG works by charging and discharging an electrical capacitor. When an additional set of sensors detect the extreme positions of the hips, they send electrical spikes to the CPG's capacitor, charging it up faster or letting it discharge more slowly, depending on where the hips are in the walking cycle. As the robot lurches forward, like a toddler taking its first steps, the next set of “extreme spikes” charge or discharge the capacitor at different parts of the cycle. Eventually, after a bit of stumbling around, the pattern of the CPG's charging and discharging and the pattern of the electrical spikes from the sensors at the robot's hip joints begin to converge in a process known as “entrainment”. At that point, the robot is walking like a human, but with a gait that matches the physical properties of its own legs.

Walking is only the start. Mr Lewis has endowed his robot with an ability to learn how to step over obstacles (see photo, top). It does this by changing the length of the three strides before the object, using miniature cameras as eyes, and the same kind of interaction with the CPG that it uses to synchronise its hip movement for normal walking.

The interesting thing is that the obstacle does not have to be defined in any way. It appears simply as an unexpected change in the flow of visual information from the cameras that the robot uses to see with. This makes the technique extremely powerful: in theory, it could be applied to lots of other forms of sensory input. Another factor that makes this project impressive is that its key component—the CPG chip, designed by Ralph Etienne-Cummings of Johns Hopkins University in Baltimore, Maryland—consumes less than a millionth of a watt of power.

The efficiency of CPG-based systems for locomotion has captured commercial attention. For the first time, parents can now buy their children analog “creatures”, thanks to Mark Tilden, a robotics expert at Los Alamos National Laboratory in New Mexico. Hasbro, one of America's largest toy makers, is marketing a product called BIO Bugs based on Dr Tilden's biomechanical machines.

After teaching robots to walk and scramble over obstacles that

they have never met before, how about giving them the means for paying attention? Giacomo Indiveri, a researcher at the Federal Institute of Technology (ETH) in Zurich, has been using a network of “silicon neurons” to produce a simple kind of selective visual attention. Instead of working with purely analog devices, the ETH group uses electrical circuits to simulate brain cells (neurons) that have many similarities with biological systems—displaying both analog and digital characteristics simultaneously, yet retaining all the advantages of being analog.

Robot bugs invade the toy market

Like the locomotion work, the silicon neurons in the ETH system work with electrical spikes—with the number of spikes transmitted by a neuron indicating, as in an animal brain, just how active it is. Initially, this is determined by how much light (or other stimulus) the neuron receives. This simple situation, however, does not last long. Soon, interactions with the rest of the network begin to have an effect. The system is set up with a central neuron that is connected to a further 32 neurons surrounding it in a ring. The outer neurons, each connected to its partners on either side, are the ones that receive input from the outside world.

The neural network has two parameters that can be tweaked independently: global inhibition (in which the central neuron suppresses the firing of all the others); and local excitation (in which the firing of one neuron triggers firing in its nearest neighbours). By varying these two factors, the system can perform a variety of different tasks.

The most obvious is the “winner-takes-all” function, which occurs when global inhibition is turned up high. In this case, the firing of one neuron suppresses firing in the rest of the network. However, global inhibition can also produce a subtler effect. If several neurons fire at the same time, then they stimulate the central neuron to suppress the whole network, but only after they have fired. The inhibition is only temporary, because the electrical activities of all the neurons have natural cycles that wax and wane. So the synchronised neurons now have some time to recover before firing again, without other neurons having much chance to suppress them.

“Millions of years of evolution have allowed nature to come up with some extremely efficient ways of extracting information from the environment.”

In this situation, the important thing to note is that the synchronised signals tend to come from the same source. Consequently, if one can find a way of allowing all to cause firing at once, then it is possible to separate an individual object from the visual scene. Local excitation improves this situation further, since the synchronised neurons are likely to be next to each other.

This combination of local excitation and global inhibition is a feature of the human brain's cerebral cortex. The combination between winner-takes-all and synchronisation produces a mechanism for visual attention, because it allows one object—and one only—to be considered. Importantly, the global inhibition makes it difficult for other objects to break in, so the attention is stable. The ETH team is thinking of building a more advanced version of its attention-getter, in which the focus of attention can be switched, depending on the novelty and importance of a fresh stimulus.

Neuromorphic engineering is likely to change the face of artificial intelligence because it seeks to mimic what nature does well rather than badly. For centuries, engineers have concentrated on developing machines that were stronger, faster and more precise than people. Whether tractors, sewing machines or computer accounting software, the automata have been simply tools for overcoming some human weakness. But the essential thing has been that they always needed human intelligence to function. What neuromorphic engineering seeks to do is build tools that think for themselves—making decisions the way humans do.

But the neuromorphic route will not be an easy one. The highly efficient analog systems described above are far more difficult to design than their conventional counterparts. Also, billions of dollars have been invested in digital technology—especially in CAD (computer-aided design) tools—that makes analog tools look, in comparison, like something from the stone age. More troubling still, almost all neuromorphic chips developed to date have been designed to do one job, albeit remarkably well. It has not been possible to reprogram them (like a digital device) to do many things even adequately.

However, as work advances, neuromorphic chips will doubtless evolve to be general purpose in a

different sense. Instead of using, say, a camera or a microphone to give a machine some limited sense of sight and hearing, tool makers of tomorrow will be buying silicon retinas or cochleas off the shelf and plugging them into their circuit boards.

At the other extreme, the combination of biological short-cuts and efficient processing could lead to a whole family of extremely cheap—albeit limited—smart sensors that do anything from detecting changes in the sound of a car engine to seeing when toast is the right colour.

In fact, the neuromorphic approach may be the only way of achieving the goal that has eluded engineers trying to build efficient “adaptive intelligent” control systems for years. Neuromorphic chips are going to have enormous implications, especially in applications where compactness and power consumption are at a premium—as, say, for replacement parts within the human body. This is slowly being recognised. For the first time in the Telluride workshop's history, one of the participants was a venture capitalist. After genomics, perhaps the next stockmarket buzz will be neuromorphics.

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REPORT: SOFTWARE

List makers take control

Sep 20th 2001
From The Economist print edition

An obscure bit of computer technology has suddenly become a subject of controversy. Electronic directories may sound arcane, but watch out for their keepers—and for the market power they will wield

TO AVOID chaos and stay in control, keep a list. The first people to realise this were the rulers of the Roman Republic, founded in 509BC. Every five years, they organised a census to count the citizens, so they could assess the number of potential soldiers and future tax revenues. As in Rome, so in information technology. There is a surge of interest in lists or, more precisely, directories. More companies are using these electronic lists to keep track not just of employees and outside partners, but of their hardware and software as well—for instance, to help IT managers with the chore of configuring computers on corporate networks.

Yet directories are not merely an obscure technology that makes life easier for corporate geeks. They are the basis of the Internet and of such popular online services as auctions, file swapping and instant messaging. Now, Microsoft is working on the mother of all directories: its Passport online authentication utility and related Hailstorm services. These could become the master list of the identities of most net users, as well as the repository of all kinds of personal information.

These ambitious plans are already the bone of much contention, and they could provoke an all-out battle in the computer industry. Privacy advocates complain that Microsoft is trying to put itself in the middle of all transactions, whether commercial or private, on the Internet—a role for which, they say, Microsoft is completely unsuited, given its less-than-stellar track record in matters of business ethics. Meanwhile, competitors are claiming that Microsoft is, yet again, abusing its Windows monopoly to force people to use Passport and Hailstorm.

What's in a name?

At their most basic, directories are collections of names with certain attributes attached. Names can be individuals, but also online services, software applications or hardware devices. Attributes can be just about anything. A corporate directory, for instance, may include the addresses of employees and their birth dates, and also information about which department they belong to and which web pages they are allowed to access on the company's intranet.

Storing all these data might seem the perfect job for the relational databases found in most companies. But directory software is a different beast. It is optimised for quick access to data that do not change

often. An individual only rarely gets a new phone number, but hundreds of people might look that number up every day. The directory software sold by Novell, the pioneer of this class of software, sifts through a billion entries in less time than the blink of an eye.

Databases and directories, however, share a common history—at least in corporate computing. Like databases, directories were originally part of other applications such as contact managers, or even part of an operating system. Recently, they have become products in their own right. This has come about because it is a hassle to update such directories separately. Also, there is now a standard way for other software to access the data in directories—thanks to the Lightweight Directory Access Protocol, developed by a voluntary body called the Internet Engineering Task Force.

It is easy to see why company networks need a sophisticated directory. Without one, computers on the network would be unable to find one another. The necessity is less obvious for a company as a whole, but it is essentially the same. Firms continue to dismantle the vertical integration they have built up over the decades, outsourcing more and more tasks, and becoming more fluid, borderless organisations. Increasingly, they need an anchor—an electronic list that keeps track of everything—to stop things from sliding into chaos.

“Increasingly, firms need an anchor—an electronic list that keeps track of everything—to stop things from sliding into chaos.”

Looking up people is the first application that comes to mind. But the “killer applications” are most likely to be in access control. To benefit properly from e-commerce, companies need to open up the firewalls that shield their internal networks from the outside world. Yet no rational chief information officer would let outsiders, or even a firm's own staff, roam freely around his precious network. You need a doorman, just like in a dance club, says Gordon Eubanks, chief executive of Oblix and a doyen among Silicon Valley's entrepreneurs.

Oblix is in the business of training such doormen—building solutions to the problem of “identity management”, as the firm calls it. The directory software is only part of the system. Oblix's software lets companies do such things as set policies about which data or application a salesman or supplier is allowed access to. Equally important, the system makes it easy to remove these privileges if an employee is fired—so he or she cannot wreak digital havoc in revenge.

Once companies have directory technology in place, they usually find other things to do with it. Charles Schwab, a discount broking firm and one of Oblix's customers, has developed more than 30 applications that rely on the information in its enterprise directory—a repository that integrates data from several sources, including the human resources department and staff contact lists. One service is eTimesheets, which replaces traditional paper forms. Another, called Best, manages information about training plans and the progress made by Schwab's 14,000 employees who have contact with customers.

Schwab shows that the real challenge of implementing a central corporate directory is not technical, but organisational, or even political. First, procedures must be put in place to keep the data up-to-date. The art is to delegate this task to people who are actually motivated to do it. In many cases, these are the employees themselves. Because employees own the information and know how current it is, self-maintenance is the rule at Schwab, says Anne Barr, a vice-president at the firm. Even if individuals are promoted, they make the changes themselves. To avoid abuses, an alert is then automatically sent to a superior.

But directories do not always mean more freedom for employees. Often they can mean just the opposite. That is because corporate directories do not hold only information about employees, but also about organisational objects—departments, teams or other groups. In corporate life, conflicts are often avoided by keeping things ambiguous. But directories force firms to make these hierarchies explicit—a task that is not always easy. At Schwab, there were several definitions of “supervisor” that had to be clarified. Not everybody was happy.

The challenges of internal corporate directories, however, pale compared with those of their big brothers: lists that are open to the public. For a start, public lists are much bigger. The Internet's Domain Name System (DNS), which links a website address such as www.economist.com with the numerical formula (eg, 164.109.58.148) that identifies the particular computer being sought on the network, has over 30m entries. Instant messaging services, which are in essence directories for keeping track of who is online at any moment, are even larger. The ICQ (“I seek you”) instant-messaging service, started by a young Israeli firm called Mirabilis in 1996 and now part of AOL Time Warner, has 110m subscribers.

As with their corporate counterparts, public directories are increasingly used to do more than just look up the addresses of machines or people. The essence of Napster, for instance, is a huge directory. The firm's computers do not store music files themselves. That would be too costly in disk space and communications bandwidth. Instead, they simply aggregate the information about which files the firm's users have on their own hard disks, and make these data searchable. The actual transfer of files takes place in a peer-to-peer fashion between users themselves.

The next big thing

Meanwhile, the list of lists is getting longer. Last year, the computer industry began to build another public directory: UDDI, short for Universal Discovery, Description and Integration. This is a central registry for what many expect to be the next big wave of computing: web services. This includes all kinds of electronic offerings that computers can access over the Internet—such as ticket reservation and voice-recognition services.

Today, using such a service is a hassle. A company has to know where it is, and even to agree offline with the provider which protocols to use so that their computers can talk to one another. UDDI is supposed to make all this much simpler—so simple, in fact, that the process could even be automated. The directory is not just a central registry of web services. It also includes a standard language to describe what each service does and a standard mechanism to invoke it.

But the most ambitious directory proposal so far is Microsoft's Hailstorm initiative—a set of web services that is due to become available sometime next year. These services are based on an online authentication service called Passport, which the software giant launched without much fanfare in 1999. Today, 160m people already have an electronic form of ID from Microsoft, although most of them probably do not realise it. Users are assigned one when they sign up for other Microsoft services such as Hotmail.

Passport will open the doors to the brave new world of Hailstorm. Just as Oblix and other directory firms propose to create a virtual backbone for their corporate clients, Microsoft promises consumers that it will unify their digital lives. The pitch goes thus: a user's personal information and other data are now scattered across the technological landscape—among numerous devices, different pieces of software, and countless websites. If people move, they need to update their addresses separately in many electronic places.

Hailstorm is supposed to make all of this far simpler. The user's information will be stored in huge data centres run by Microsoft and reached via the Internet when needed. Initially, Hailstorm will encompass a set of 14 services: from easy-to-understand things—such as myAddress, myProfile or myCalendar—to more novel offerings, including myLocation (a user's electronic and geographic whereabouts), myNotifications (e-mail alerts delivered to another device) and myWallet (payment information, electronic coupons).

Microsoft's idea is that these services will allow websites and groups of people to co-operate far more easily than is possible today. Imagine that you want to go on a vacation trip with your friends. You could co-ordinate your trip via the myCalendar service. A travel site could take that information, plus data from myProfile, to put together a tailored package for flights, hotel and entertainment. And it could arrange for payment through myWallet. Later, if the plane is late, myNotifications would send out an alert to a mobile phone specified in myDevices.

Earl Perkins, a consultant with Meta Group, in Stamford, Connecticut, reckons that deploying a corporate directory is 80% process and people, and only 20% technology. If that is the case, then the ratio for public directories that everybody relies on is more like 99% to 1%. Witness the debate about adding new top-level domains to the Internet's Domain Name System. Technically, this is trivial. But it is only today—more than five years after the process began—that seven new domains are at last being added to the DNS, the first two being .biz and .info.

It is easy to see why the DNS has become so controversial. Its governing body, the Internet Corporation for Assigned Names and Numbers (ICANN), theoretically presides over life and death online: if a domain name is not listed, the corresponding website is extremely hard to reach. ICANN must thus deal with many vested interests. If it has taken so long to extend the DNS, it is mainly because trademark owners worry that new top-level domains will dilute their brands. Coke.com, for example, did not want to worry about Coke.biz.

The controversies that have erupted over ICANN may be just a foretaste of things to come. The operators of directories such as UDDI or Passport/Hailstorm are potentially more powerful than the body that controls the DNS. These directories are a kind of operating system for the new world of web services, on top of which other offerings can be built, just as Windows is a platform for PC applications. And just as owning Windows is an extremely profitable business, so might be running directories.

Firms might earn a lot of money by simply charging for access, or possibly by taking a cut of all transactions done using their directories. As the airlines used to do with their reservation systems for travel agents, directory operators might make access easier for their own services and harder for those of their competitors. Or companies might mine the data in their directories so they could peddle additional offerings to online customers. Already, a foretaste of such cross-marketing can be experienced when purchasing goods at Amazon.com.

More abuse?

Critics worry that this is what Microsoft will do if Passport and Hailstorm take off. Worse, they say, the company is about to abuse its Windows monopoly to build a master list for the Internet. The next generation of the operating system, called Windows XP, which is due to go on sale on October 25th, will push users to sign up for the Passport service when they first connect to the Internet.

To Microsoft, such carpings are merely sour grapes. Passport, they say, will be free, and the fee for the Hailstorm services will be a very reasonable $20-50 a year. Since these services will be based on open standards, everybody will be able to access them—even users of devices that do not run Windows. And subscribers will own the data, meaning that only they can change it or allow others to have access to it. What is more, says Microsoft, competitors such as AOL Time Warner or Yahoo! are sure to offer similar services, and they have customer bases that are equally large for promoting their services.

Microsoft has a point. Its competition is certainly not sleeping. In response to Passport and Hailstorm, AOL is apparently working on a set of similar services, code-named Magic Carpet, which are an extension of the company's existing Screen Name Service that lets users sign on to multiple websites. Big online firms are likely, at least initially, to support several different identity services. The auction site, eBay, has announced that it will welcome users of both Passport and Magic Carpet.

Yet the issue is not whether there will be competition, but how long it will last. As with PC operating systems, these directories seem to be a winner-take-most market, thanks to their network effects. The more users who sign up for, and the more services that are built on top of, a directory, the more attractive that directory becomes for extra users and service providers. Microsoft has certainly made sure that Passport and Hailstorm can benefit from this happy circularity. Although the standards for accessing the services are open, their inner workings are proprietary. It will be all but impossible for Hailstorm users to switch to another service and take their data with them. Details of AOL's plans are not yet known, but it is unlikely that it will offer a completely open solution.

“ICANN has created more heat than light because it is trying to turn a highly centralised governance system into a more decentralised one.”

Because directories are often such a crucial bit of infrastructure, governments have traditionally assumed the job of overseeing them. In fact, although competition is now the rule in telecommunications, the telephone numbering system is still regulated in most countries, even if its day-to-day management may be contracted out to private organisations. In America, for example, the Federal Communications Commission is ultimately in charge, but the database containing all the country's telephone numbers is run by NeuStar, a year-old spin-off from Lockheed Martin. NeuStar is also the administrator of .biz, one of the Internet's new top-level domain names.

Government involvement has its own drawbacks, however. It often slows innovation and gets things wrong. In some ways, ICANN is an attempt to find a third way between private and public monopolies, taking advantage of the traditional consensus-building approach adopted by Internet groupies. It has spawned a raft of committees, working groups and support organisations. They are supposed to talk things out, with the 19-member ICANN board, in theory, ratifying the results.

Controversy rules

The main reason why ICANN has so far created more heat than light is that it is trying to turn a highly centralised governance system into a more decentralised one. Before ICANN, the DNS was in essence run by one company, Network Solutions, and one person, the late Jon Postel. Now, there is lively competition between registrars of top-level domain names. To avoid many of ICANN's problems, an open alternative to Passport needs to be built as a decentralised system from the start, with many organisations issuing online IDs and users holding more than one—rather as the credit-card market, which has caused much less concern, is now organised.

This is what XNS, short for extensible name service, wants to be. It is a fledgling authentication and information exchange service that offers many of Passport's features and was developed by Onename, a start-up firm based in Seattle. But XNS will certainly not remain the only open Passport alternative. Sun Microsystems and others may launch another sometime this autumn. Meanwhile, the UDDI web services project could become a model for an open directory—although it is still rather centralised. Two implementations exist, both continuously synchronised and run by Microsoft and IBM, the co-founders of the project, along with Ariba, an e-commerce firm. This trio is also part of the core group of 15 firms that is now overseeing the effort, but plans to hand over the reins to an existing standards body within the next six months.

It may even be in Microsoft's interest to find a similar solution for services such as Passport and Hailstorm, at least in the long run. The officials who oversaw the census in Rome became some of the most powerful politicians of the republic, though some ultimately paid for that position with their lives. If Microsoft succeeds in building the mother of all directories, it will surely be just a question of time before the trustbusters try to take that monopoly apart.

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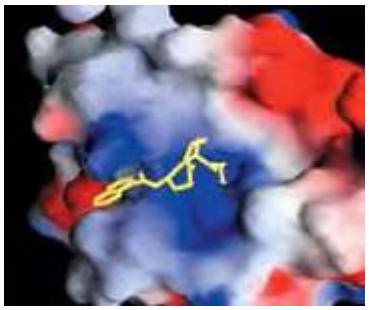
REPORT: PHARMACEUTICALS

Drugs ex machina

Sep 20th 2001
From The Economist print edition

Thanks to automation, miniaturisation and information technology, drugs companies are at last preparing to reap the rewards of genomics



THE thrill of chemistry used to come from watching crystals grow, potions bubble and change colour, and innocuous mounds of white powder sublime unexpectedly away leaving only a nasty niff behind. All that has gone, or is going fast. Instead, chemistry labs are looking increasingly like those of engineers and physicists. In place of white-coated researchers toting test-tubes and scribbling in notebooks, there are ranks of computers sifting silently through complex algorithms, or robots scurrying around banks of glass and steel equipment. Surprisingly, nobody seems happier about this than the chemists. They are looking to their new silicon assistants to help them streamline the whole painstaking process of finding new chemical compounds that may turn into blockbuster drugs.

The “genomics revolution” wrought by the ten-year, multi-billion-dollar effort to sequence the human genome (ie, to work out the protein blueprint for building a human being) was supposed to have two profound effects. First, it was going to bequeath a wealth of information on genes and proteins; and, second, it promised to deliver a battery of new wonder drugs to conquer debilitating diseases. So far, the optimists have been only half-right. Databases in life sciences are growing faster than anywhere else. Sia Zadeh, who directs the life-sciences initiative at Sun Microsystems in Palo Alto, California, predicts that this business will require computer memories measured in petabytes (ie, billions of megabytes) long before any other.

Unfortunately, the deluge of data has yet to spur any dramatic increase in the number of new drugs discovered. Drug discovery remains as haphazard and costly a process as ever. This is because implicating a gene or protein in a particular disorder does not make manipulating it any easier. To make drugs, chemists need more than data on gene-protein or protein-protein interactions. In particular, they need detailed information on how the protein in question interacts with the compound under study. Gathering this information is the goal that large pharmaceutical laboratories around the world have now set themselves.

The aim of “chemical genomics”, as this new technology has become known, is to screen as many protein targets as possible against as many potential drugs as possible. To improve their chances of finding something useful, drugs firms are inventing new ways to conduct experiments in parallel. In turn, collecting and analysing the data is forcing them to develop new automated instruments and toolkits. In short, to reap the rewards of genomics, pharmaceutical firms are having to computerise and automate the process of drug discovery to a far greater extent than they ever have before.

This is no mean task. All the drugs that have been invented to date have come from targeting the protein products of only 500 genes. Researchers guess that the human genome contains between 30,000 and 40,000 genes—a tenth of which are reckoned to be possible targets for new drugs. So there is plenty of scope for improvement. But even if chemical genomics does not increase the absolute number of new drugs being discovered, it is certain to boost the efficiency of the innovation process—and that, alone, will pay handsome dividends. At present, only 1% of a drugs firm's discoveries ever reach the market; the remainder have to be written off as a loss. According to a recent report from the Boston Consulting Group, genomics could reduce the cost of producing a new drug by $300m.

As practised today, the process of drug discovery relies on brute force rather than strategy. When researchers identify a protein they wish to control, they

“ All this assumes that the structure

test it against a library of up to 1m compounds using a “high-throughput screening” process. The chemicals that show some form of activity when they come in contact with the protein are then culled. Through a process known as “lead optimisation”, variants of these compounds are generated and collected in another library, and the entire procedure is repeated.

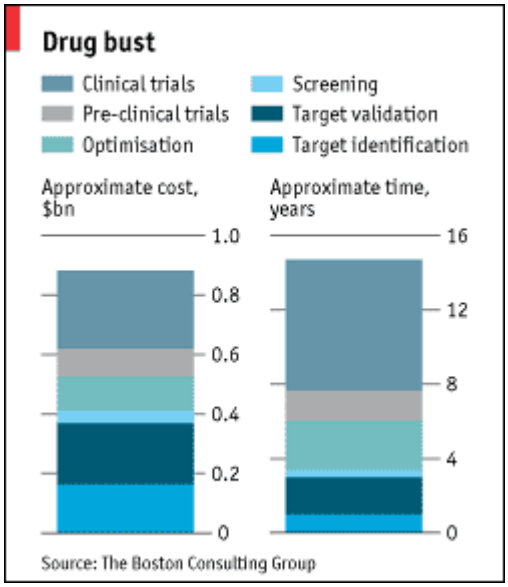
of the protein can be solved. Haemoglobin, the first protein to be solved, took 22 years to crack.”

Six years and some $200m later, the best candidates enter preliminary human testing. Only then can the researchers start the tedious process of testing the toxicity and effectiveness of the drugs in human subjects—a procedure that can cost a further $500m.

Have a target in mind

The path to human testing could be shortened if protein structures were as easy to work with as gene sequences. Once a protein structure is determined (or “solved”, in the language of genomics) and then programmed into a computer, researchers can design their compound libraries with the target in mind. This approach, called “structure-based drug design”, has already resulted in a couple of successful anti-HIV drugs. Moreover, researchers can use the computer-visualised structure to conduct preliminary rounds of high-throughput screening in a computer (*in silico*) rather than in a test-tube (*in vitro*). This is not only a quicker alternative, but cheaper to boot.

All this assumes, however, that the structure of the protein can be solved—and that is no easy task. Haemoglobin, the first protein to be solved, took 22 years to crack. Since the Protein Data Bank, run by a non-profit consortium called the Research Collaboratory for Structural Informatics, started gathering structures in 1972, some 15,000 structures have been added, but only 10% of these are genuinely unique. A typical pharmaceutical company may solve only five to ten structures a year.



That could be about to change. Two companies based in San Diego, Syrrx Pharmaceuticals and Structural Genomix, have made bold claims. Both reckon that, within the next few years, they will automate protein-solving and accumulate hundreds of structures. This endeavour has come to be known as “high throughput X-ray crystallography” (HTX). The technique relies on the fact that, when an X-ray beam passes through a crystallised molecule of a protein, it creates a diffraction pattern (a kind of molecular imprint) that can be used to calculate the location of atoms in the crystal. While a crystal structure now costs about $250,000 to solve, Tim Harris, the chief executive of Structural Genomix, says that it could eventually become possible to do it for a tenth the price.

In the Syrrx process, a robotic arm inserts 300-600 genes into bacterial cells and coaxes them into producing proteins. Using sound waves, a robot called Sonic Hedgehog (after the Sega hero) splits open the protein-packed cells. The raw protein they contain is then purified automatically and passed on to Agincourt, a crystallisation robot. Agincourt can run up to 140,000 crystallisation experiments at once to find the best conditions for coaxing a sample of protein to form crystals.

Meanwhile, imaging devices which take digital snapshots four times a second work out when the sample is ready. Minute quantities of crystals—measured in billionths of a litre—are then taken to a particle accelerator in Berkeley, California. There, the samples are exposed to synchrotron radiation, a high-energy X-ray that helps to produce an image of a protein's shape. Finally, the Robohutch robot gathers the image data and works out what the protein must look like.

Once a protein structure is stored in a database, a computer can be used to screen it virtually for potential docking points where a drug might attach itself so as to do its job. That makes it possible to identify the most promising lead compounds. At Syrrx, a crystal structure can be screened against a library of 2m compounds in less than two days.

Model behaviour

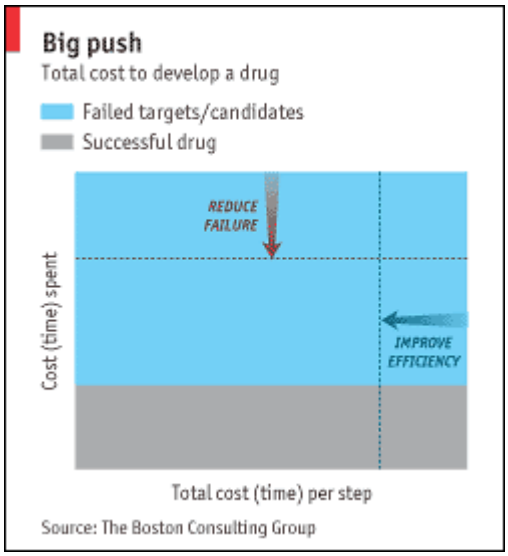
Typically, a single screening process, either *in vitro* or *in silico*, produces millions of data points. Once, 99% of such data had to be discarded, leaving a chemist with “only” 10,000 or so data points to mull over, with ordinary spreadsheet software and weeks of patience.

No longer. Software produced by a company called Leadscope of Columbus, Ohio, now lets chemists analyse all the data from high-throughput screens immediately. If need be, all the data from all the screenings that a company has performed can be visualised and mined simultaneously. All a pharmaceutical company needs to do is to link Leadscope's software to its own database of chemical structures and their biological activity. The software then compares the company's database with the program's catalogue of 27,000 chemical substructures. By correlating classes of chemicals with biological activity, the program can tell researchers which features of a test compound are important. Given that, researchers can pluck out and refine promising leads far more quickly.

Leadscope has also just launched a piece of equipment that screens compounds for their toxicity. For the past two years, the company's researchers have scoured public information sources to compile toxicity profiles of 150,000 chemicals. By searching this new database, dubbed Toxscope, with the chemical fingerprint of a promising lead compound, researchers can get an early warning of whether it is going to be too toxic for people to take.

Predicting other chemical characteristics of a drug would be useful, too. Once a drug is swallowed, it has to be absorbed into the bloodstream and circulated to the tissues of the body. As the drug does its work, it is attacked and gradually destroyed (“metabolised”) by various enzymes. Eventually, these breakdown products are eliminated from the blood through urine or bile. Up to now, drugs companies have found it difficult to model the way a compound goes through the various processes of absorption, distribution, metabolisation and elimination (what the industry labels a drug's “ADME profile”). This ignorance is costly. Bad ADME characteristics account for the majority of failures of new drug candidates during development.

Using a combination of empirical data and molecular modelling, Camitro, a chemical genomics firm based in Menlo Park, California, has developed software that tries to predict a compound's ADME characteristics. If the characteristics are undesirable, the compound can be discarded before too much money is spent developing it, or redesigned to have better properties. The software's absorption model uses data gathered from living humans to predict how a compound will penetrate through the intestinal wall and the blood-brain barrier. The model for metabolism, on the other hand, exploits the fact that the cytochrome enzyme, CYP 3A4, performs the majority of drug metabolism in the body. After modelling the active site of this enzyme, Camitro's researchers have been able to predict what sort of substrates CYP 3A4 can capture, and how strongly. The firm is now improving the model by adding information on the behaviour of two other metabolic enzymes in the CYP family.



When drugs interact

Camitro's software also has the potential to provide information on another subject of growing interest to pharmaceutical firms—the interactions that can take place between two different drugs that a patient may be taking for different ailments. Medications need not interact directly to have potent effects on one another; they can exert effects through an intermediate compound. If, for example, most of the body's metabolic enzymes are being bound up tightly by one drug, then another drug may float around in the bloodstream intact far longer than its inventors would have intended. A drug may also reduce another's potency. “St John's wort babies” is the name given to the offspring of hapless mothers who did not realise that taking the herbal remedy would encourage the metabolic breakdown of their birth-control pills. By mapping out the possibility of such interactions, such prediction software can make picking or discarding leads a more efficient process.

Gradually and belatedly, the big drugs firms are starting to pay attention to the importance of *in silico* methods. In 1999, Aventis, a large pharmaceutical firm based in Frankfurt, launched a program aimed at discovering kinase inhibitors through structure-based drug design—in a bid to make better use of genomic information. The firm is currently trying to negotiate access to protein structure databases such

as those offered by HTX companies. It is also creating an in-house unit for generating protein crystallisation data.

Alan Collis, the head of chemistry for Aventis in America, says that, during post-merger talks between Aventis's parent companies (Hoechst of Germany and Rhone-Poulenc of France) in 1999, the company realised that it had a serious “skills gap” in genomics and chemistry. To fill that gap, the firm created various specialist teams, including an informatics group and a team devoted to virtual screening. Since then it has added other groups for predicting the absorption, metabolism and toxicity characteristics of new compounds. Dr Collis reckons that this should accelerate the progress of potential drugs through the company's development pipeline by 15-20%, lower the attrition rate among prospective compounds and reduce its dependence on high-throughput screening processes.

Vertex Pharmaceuticals, based in Cambridge, Massachusetts, has been singled out by many of the more established drugs companies as a role model worth emulating. Over the past decade, Vertex has pioneered many of the techniques that are now entering the pharmaceutical mainstream—including molecular modelling, structure-based design, virtual screening and efficient data-mining as well as ADME and toxicity prediction. It is no surprise that Vertex has been effective at cracking problems that the big pharmaceuticals have not.

During the 1990s, Vertex entered the race to develop an inhibitor for inflammation. Once it solved the structure of the enzyme ICE (interleukin-1-beta converting enzyme), Vertex, in collaboration with Aventis, used *in silico* methods to screen and refine lead candidates. Mark Murcko, chief technology officer at Vertex, reckons that it took eight months from the time that ICE's structure was solved to synthesise a lead compound in the correct chemical class. Two years later, the company had a compound in formal pre-clinical development. By comparison, the industry average is four to six years. The compound, dubbed Pralnacasan, is currently in phase II development, and is still the only ICE inhibitor in clinical trials.

Protein modelling has enabled Vertex to make a big shift in its strategy. It is now examining related protein targets in parallel rather than in sequence. Proteins occur in families whose members look similar to each other; but proteins can belong to several different types of families. Some families share the same parent gene or have similar amino-acid sequences. Others have similar looking active sites, but are different everywhere else.

“Only a quarter to a third of all protein targets are amenable to structure-based design. ”

Vertex's software digs out and exploits these family resemblances. Researchers screen compounds against a whole family at once, betting that the drugs that show activity against one protein will also affect its cousins. They also perform the reverse trick. Tailoring the molecular structures of compounds to a protein's active site allows researchers to formulate chemicals that look different but react to a protein in a similar way. As a result, Vertex has been able to match many targets to many compounds quickly. A more conventional approach would produce one drug per target, if that.

The final payoff

This multi-drug, multi-target approach may pay off enormously in Vertex's collaboration with Novartis, a Swiss pharmaceutical company. Vertex and Novartis are searching for drugs that will target the 500-odd proteins in the kinase family. Kinases are implicated in a broad swathe of nasty (but potentially lucrative) ailments, such as stroke, cancer and diabetes. The deal, worth more than $800m, entitles Novartis to a share of the profits from the first eight drug candidates identified by Vertex. Dr Murcko believes that, ultimately, as many as 50 of Vertex's kinases could result in drugs. From the ninth compound onward, the royalties go much more in Vertex's favour.

Its technical sophistication has made Vertex's innovation pipeline highly efficient compared with the rest of the industry's. Normally, a compound picked for formal development has a 10% chance of making it to the start of phase II clinical testing. At Vertex, that figure is now 80%, although Dr Murcko expects that the figure may drop somewhat once the low-hanging fruit have been picked.

Vertex offers a big lesson in how to exploit the raw data created by genomics. At their core, these technologies make it easier to visualise and organise biological and chemical information. Just as the power of the Internet to distribute data globally only came into its own after the World Wide Web had been invented, and a user-friendly browser (Mosaic) had been devised to visualise what was stored, so genomic data will not be able to add value to the business of discovering new drugs until those data can

be easily analysed and manipulated. Thanks to ever more powerful computers, *in silico* technologies will allow genomic information to be accessed by anyone with the right equipment. In Internet speak, they "democratise" the information.

But, as any Internet veteran will confirm, this democratisation carries a cost. When all players possess the same information—identical catalogues of genes, identical protein structures and identical software—winning the game becomes increasingly hard. In drug discovery, as in the early days of e-commerce over the Internet, a land-grab made the best sense. Likewise in chemical genomics. Certain families of proteins—eg, the kinases, the proteases and the G-protein-coupled receptors—have hundreds of members, although in the end they may yield only a few useful targets. Even so, casting a wide net quickly over such territory is probably the only way, in the short term, to stand a chance of scoring a hit.

In the longer term, however, such a strategy could lead to something comparable to the dotcom disaster. The warnings are already being whispered. Dr Collis, for example, reckons that only a quarter to a third of all protein targets are amenable to efficient crystallisation and structure-based design. The rest will require the brute force methods of blind screening that have been used for decades. Five years down the road, when all the low-hanging plums have been picked and canned, it will be back to the drawing-board for drug makers.

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Last word

An incurable itch

Sep 20th 2001
From The Economist print edition

Carver Mead claims to have never had an original idea. Others call him a prophet, a genius and one of the founding fathers of information technology

Carver Mead, chipman extraordinaire

THE creative process, says Carver Mead, is like an itch that has to be scratched. His scratching has led to the invention of new electronic devices, novel approaches to circuit design and systems that mimic a variety of biological functions. He says he has never had an original idea in his life. Others disagree. People call him a gadfly, a prophet, a true genius, an interesting bird—and modern information technology has much to thank him for.

In 1968, as a young professor of electrical engineering at the California Institute of Technology (Caltech), Dr Mead challenged conventional wisdom by working out the limits to how small a functioning transistor could be. The dimension he came up with was 0.15 microns (ie, 0.15 millionths of a metre). Within 10-15 years, he reckoned, millions of transistors would fit on a single chip. And chips with such very large-scale integration (VLSI) would also run faster and use less power.

Most people laughed. Such predictions seemed counterintuitive. But in demonstrating what was possible, he set in motion a train of events that pushed the electronics industry towards miniaturisation. To this day, Dr Mead has a healthy appetite for questioning the prevailing orthodoxy.

A fifth-generation Californian, Dr Mead grew up in Big Creek, a small settlement in the high Sierra country between the Yosemite and King's Canyon national parks. His father managed the local power plant and hoped that his only child would be a dentist. But there was a lot of technology around, and another worker at the plant told him about places in Fresno that sold war-surplus electronics. That was an enabling technology for a young person, recalls Dr Mead, who took to scanning the backs of old ham radio magazines for adverts, and reverse-engineering in his mind the devices he saw described there. He calls it an early electronics education, by way of archaeology.

Although at heart a physicist, Dr Mead read electrical engineering at Caltech and stayed on after graduating in 1957 to take a job as a lecturer in transistor electronics—an occupation he likens to “spelunking”, the hobby of exploring caves, because it was new and full of darkness. For example, how an ohmic contact worked was still a mystery, even though every transistor has three of them connected to its active terminals. Dr Mead tackled this and other problems with alacrity. In 1965, over the Thanksgiving weekend, he devised a transistor called the MeSFET to circumvent the limitations of “transmitter-type electronics”. Slow to catch on, the device is now widely used in mobile phones, satellites and other microwave communications systems.

Design rules

Dr Mead's prediction about the lower limit of the size of transistors had enormous implications. In 1968, nobody had a clue about how to design a chip with a million parts on it. At the time, chip designs followed complicated rules and were painstakingly patterned by hand on Mylar sheets. Only large semiconductor companies had the resources to design and manufacture such chips, which meant that standardised circuits dominated. Working with simple computer tools and plotting machines, Dr Mead and his students came up with a technique that dramatically simplified the design methods, opening the

way for custom chips that anybody could make.

The question then was how to disseminate the technology. In the mid-1970s, Dr Mead and Lynn Conway of Xerox's famous Palo Alto Research Centre started writing a book called “Introduction to VLSI Systems”. On Ms Conway's urging, several of the early chapters were made available well before the book was finished, so that engineering schools could teach the principles of VLSI. The authors also devised a mechanism that enabled university laboratories to make prototype chips rapidly.

This strategy was wildly successful. In short order, students who knew how to design and make custom chips were infiltrating companies across America. Not surprisingly, the semiconductor establishment—with its heavy investment in plants that made standardised components—was less than pleased. Teaching users to design custom chips of their own was bad enough, but then Dr Mead started promoting the notion of the “silicon foundry”, as a place that could actually make them. The idea—later to become the basis of the Taiwanese semiconductor industry—was to encourage independent chip makers to accept circuit designs from outsiders and fabricate the chips as contract manufacturers. After their initial horrors, one by one the large semiconductor firms embraced the new order, and a powerful wave of innovation flowed through the industry.

“Colleagues and former students stress his infectious enthusiasm, his notion of work as a shared quest, and his keen scientific intuition. They call him a free spirit, even a wild man.”

As VLSI chips became more complex, Dr Mead was one of the first to appreciate that the natural mode of electronic computing was in a massively parallel manner—with many computations being done simultaneously in concert, rather than as a series of step-by-step processes. After all, in the biological world, that is how brains function. This set Dr Mead thinking about how a fly can process sensory information much faster than even the most advanced digital computer.

Building an entire eye or ear was clearly out of the question, but something similar might be done using analog circuits to simulate the workings of parts of the animal's nervous system, such as the retina or cochlea. The new endeavour, dubbed “neuromorphic engineering”, turned out to be harder than anybody had imagined, but Dr Mead's group made important first steps—and a handful of laboratories around the world are carrying the field forward (see article). In his opinion, the best attempt to date is a stereoscopic vision system constructed by the late Misha Mahowald while he was a student at Caltech.

Although he has spent most of his life as an academic, the mortarboard is not the only hat in Dr Mead's wardrobe. He started his first company, making audio systems, while still in high school. Later, during a visit to Boston in his early days at Caltech, he was introduced to a French venture capitalist who taught him the start-up business. Over the years, Dr Mead has had a hand in starting some 25 companies. He even took part in the founding of Intel, now the world's biggest semiconductor firm. His latest enterprise, Foveon, makes high-resolution imaging chips for digital cameras.

Nested complexities

He is also a mesmerising public speaker, sporting a goatee beard and delivering his message with a soothing twang. Close up, he is gracious, friendly and a little frayed around the edges. The life he recounts suggests nested complexities. He talks readily about a string of personal tragedies, including the murder of his 18-year-old daughter. His two marriages ended in divorce. Today, he and his partner of nine years, a sculptor, live in a house he built in the redwoods outside Palo Alto in California.

Colleagues and former students stress his infectious enthusiasm, his notion of work as a shared quest, and his keen scientific intuition. They call him a free spirit, even a wild man. “What I've done for most of my life,” he says, “was to give people a framework for thinking about things, which made it easier for them to do what they needed to do.” It also makes it hard to pin a label on him, though he has not gone without recognition. In 1999, he received the $500,000 Lemelson-MIT prize, the world's largest single prize for invention and innovation.

The most public of Dr Mead's admirers is George Gilder, a technology guru, author and *éminence grise* during the Reagan administration. “No single individual has exerted a more profound influence on modern human

productivity," Mr Gilder wrote of Carver Mead in *Forbes* in 1988. One of Dr Mead's past students notes that Mr Gilder's "Microcosm", a bestseller in 1989, "might as well be a biography of Carver."

Re-inventing photography

Dr Mead shares with Mr Gilder a belief that the information economy is the basis for a peaceful and prosperous world. Unlike zero-sum economics, in which one person's gain is another person's loss, information technology represents an opportunity shared. Better still, it enfranchises people who might not otherwise have a chance to participate. In Dr Mead's view, information technology is the great equaliser. Its distributed nature has the virtue of making it less amenable than, say, broadcasting to being controlled in some malign way. Interactions over the web, he says, are more like conversations than reading books or watching television.

Nobody, muses Dr Mead, would have predicted how combining computing and communication would give rise to the web. Similarly, almost nobody saw that the problem with transistors was not the devices themselves, but the way they were interconnected. Then the problem became not how to make better integrated circuits, but how to design circuits of ever higher levels of complexity. As the complexity increases, new solutions emerge—because things become possible that were impossible before.

Asked about the future of the digital computer, Dr Mead draws a parallel with a century-old oxygen cylinder that he uses on his hazelnut farm in Oregon. What works, works, he says. The digital computer in the form we know it today will probably be around forever. "You can't get enough additional value by doing it differently to outweigh [the value of] the system that's currently in place."

But the usefulness of silicon—the basis of the semiconductor industry for the past 40 years—is definitely approaching its limit. So what comes after silicon-based computing? There are lots of suggestions: molecular computing, quantum computing or neuromorphic engineering, to name three. All are ways of thinking beyond the present paradigm. But, as yet, there are no totally workable schemes for realising any of them.

Dr Mead retired in 1999. He still offers consulting advice and gives talks, spending several days a week on the Caltech campus in Pasadena, where he maintains an office along with another at Stanford University. He is currently between projects, but already the itch has started again.

Last year, he published a book entitled "Collective Electrodynamics" that confronted some of the biggest questions in physics head on. In it, Dr Mead proposes a new way of understanding electromagnetic theory from the vantage point of quantum mechanics. He wants to do the same thing for the theory of gravitation, which he says is opaque and intuitively hard. For now, he is "playing around" with the idea, attending seminars and dining with astronomers. Not long ago, he spent a week in Hawaii peering through a telescope. That is what retirement means, he says. Finally, you get to do what you want instead of what somebody else wants.

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World airlines

Uncharted airspace

Sep 20th 2001
From The Economist print edition

EPA

Many of the world's airlines are flying blind and broke into their biggest-ever crisis

“THERE was total panic in the airline industry at the highest level last week,” says one industry source. No wonder: no industry has ever faced such a sudden crisis, or such an uncertain outlook. Since all American flights were grounded after the disaster of September 11th, the airlines have bled about $650m. The immense losses are continuing, because the airlines are now flying, but half-empty. When flights resumed this week, bookings were about 70% down in America. To save themselves, the airlines are frantically cutting jobs: on September 19th, United and American Airlines each announced cuts of 20,000 jobs.

On September 18th the industry held talks with the administration about a package of cash, loan guarantees and tax cuts, worth a total of $24 billion. As *The Economist* went to press, the airlines were being offered $5 billion in cash, $3 billion to pay for extra security and an agreement by the government to take on their huge potential legal liability. However, requests for loan guarantees of more than $11 billion were on hold, and it was still unclear whether some airlines would be filing for bankruptcy within days.

Airlines cannot cope with a sharp fall in revenues: they are capital-intensive and need to maintain a network, which means high fixed costs. Aircraft cost up to $200m each and an airline must fill three-quarters of its seats to make any money: even a fall of five percentage points in traffic can wreck operating economics. So a short-term fall of more than two-thirds is crippling, even if it is reversed later in the year.

However, even before the terrorist attacks, travel was falling. America's airlines were forecasting losses approaching $3 billion this year (the death toll of passengers would have been far higher had the four aircraft not been half-empty). Now the loss figure is expected to top $5 billion. For losses worldwide, IATA, the airlines' trade association, hazarded a figure of $10 billion. But this implies that the non-American half of air travel will be as badly affected as the American, and that will not be the case: Europe will be hurt, but East Asia may suffer less.

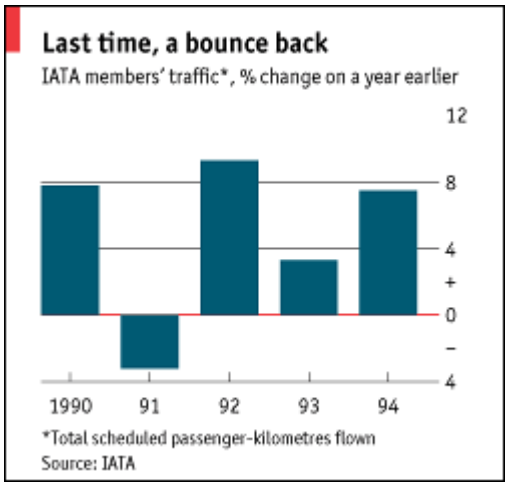
Bleak future

Because nobody can predict how long an anti-terrorist war will last, nobody can predict the airlines'

future. But one possible parallel may be the freeze on expansion of the nuclear-power industry that followed the Three Mile Island accident in 1979. Then, the public lost confidence and regulators demanded billions of dollars of extra safety requirements. The immediate danger facing America's airlines, though, is not of excessive regulation but of simply running out of cash.

An alternative precedent may be the 1991 Gulf war, when air travel fell by 25% across the Atlantic, by 55% to the Middle East from Europe, by 12% inside Europe and by 4% inside America. If this is the right comparison, it is slightly more comforting: the airlines bounced back in 1992 (see chart). Nevertheless, the world's big carriers lost as much as $15 billion between 1990 and 1993, as a result of the war and the recession. And the recession that has been engulfing American airlines since the late spring was already going to be worse than it was then.

American airlines are not alone. Airlines in Canada, Mexico and Europe are also suffering. Air Canada has asked for government aid, and Aeromexico says it is laying people off. The European carriers met the European Union's transport commissioner on Thursday to plead for aid. Analysts at Schroder Salomon Smith Barney in London are forecasting net losses for European carriers of *euro*775m ($713m), compared with a previous forecast of net profits of *euro*645m, with further falls next year. All European airlines, except possibly the low-fare carriers such as easyJet, Ryanair and Go, are exposed because they have even higher debt burdens than most American airlines.



The most dangerously exposed Europeans are British Airways and Virgin Atlantic, which rely heavily on transatlantic profits. However, they are responding by cutting jobs, and not just routes: BA announced job cuts of 5,200 on top of an earlier 1,800. Last year, BA made about £470m ($695m) of profit flying the Atlantic, offsetting losses of some £170m in Europe. Virgin Atlantic, which has announced 1,200 job losses and grounded five aircraft, says it may lose as much as £200m. Other airlines, such as KLM and Lufthansa, have also warned of losses or profit falls. Europe's two financially weakest big airlines are Swissair and Sabena, and this crisis could push either or both over the edge.

America's flight patterns are based around regional hubs, into which passengers are shipped to change aircraft and fly on to final destinations. This intense system will be put under great pressure by the need for extra security measures. Keith McMullan of Aviation Economics, a consultancy based in London, thinks that the effect will be to increase the already fast-growing trend towards direct flights, such as those operated by Southwest Airlines.

Bob Crandall, a former chairman of American Airlines, concedes that the hub-and-spoke system that he invented will have to adapt. He thinks that slower check-ins and transfer times will prevent the airlines from operating big waves of flights at peak times, because passengers will not be able to connect quickly enough. So he foresees a move towards larger aircraft and reduced frequencies. But the inherently superior economics of a hub-and-spoke network (you need fewer aircraft) will probably still prevail.

Nevertheless, the tight security measures will mean that turnaround times of 45 minutes will be unattainable. So airlines will get fewer flights out of each jet per day. This will raise their unit costs—as will extra security measures, such as properly trained and paid screening staff.

A more clear-cut consequence could be consolidation in America and Europe. The industry was in a swirl of restructuring when disaster struck. United Airlines' proposed takeover of struggling US Airways, blocked by regulators, had left its target exposed. Northwest Airlines and Continental were also threatened by the national dominance that American Airlines acquired once it had swallowed TWA this spring, and were widely rumoured to be considering merging.

With the industry in distress, regulators seem sure to be more tolerant of mergers than in the past. United was forbidden to buy US Airways on competition grounds. That prohibition may now be waived. In Europe the pressures on Swissair, Sabena, KLM and BA could lead to renewed efforts by these four to form new combinations. It is even possible that regulations limiting foreign stakes to 49% will be loosened, especially as the EU is seeking to take over the powers of member countries in international aviation negotiations. The crisis could also speed approval of the virtual mergers of transatlantic flights sought by BA and American Airlines and by Delta Air Lines and Air France.

The buffeting that the airlines are getting will be passed on to Boeing and Airbus, the two makers of big jets. Boeing has already announced job losses of up to 30,000 over the next 12 months, as falling orders cause output to fall from more than 500 aircraft this year to just over 400 next year and 350 in 2003. The job cuts amount to almost one-third of the company's workforce making civil jets, and more could be on the way. Airbus should cut fewer jobs, but its hopes of ramping up production from 311 aircraft last year to 450 in 2003 will be dashed. Its super-large A380, launched last year, will almost certainly not now get the 100 orders expected by the end of the year. Lufthansa's decision to postpone its A380 orders was a sign of things to come. Airbus's parent company, EADS, which relies on its civil jets for nearly all its profits, said on Thursday that it was sticking to its profit targets.

One day, no doubt, air travel will return to its previous growth path, in both America and elsewhere. But long before that, the colours on the jet tails may have changed and some familiar names may have disappeared. It might have been better had the administration urged the airlines to go into chapter 11 bankruptcy before helping them out of the abyss. After all, although terrorism (assisted, sadly, by poor security screening) will account for half their losses this year, the other half would have happened anyway.

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Hollywood and disaster

Re-edit

Sep 20th 2001 | LOS ANGELES
From The Economist print edition

Will filmgoers lose their taste for carnage?

AP

Safe viewing

AMERICANS used to enjoy films with huge explosions and collapsing buildings. But now that television has brought them such scenes not as special effects but as news, the entertainment industry is fretting about what they will want to watch in future.

The immediate impact on Hollywood of the terrorist attacks on New York and Washington was the cancellation and postponement of several projects that were already under way. The most expensive cut was “Collateral Damage”, in which Arnold Schwarzenegger plays a fireman whose family is killed by a terrorist bomb. Warner Brothers, the studio behind it, had already spent $20m on advertising its release on October 5th, on top of a production budget of $100m. Now it may never be shown.

A television series about bio-terrorism in New York that was announced in the daily *Variety*, a trade paper, on the very morning of the attacks is also now unlikely to go ahead. Films such as “Men in Black 2” are being tinkered with to remove scenes featuring the World Trade Centre. Similar quick adjustments have had to be made at the TV networks, which pulled several bloody thrillers from their weekend schedules.

Deciding what should replace the mayhem of expensive action films will be harder than coming up with these reflex actions. Politicians have berated the standards and morals of the entertainment industry for years, to little avail. What shapes the business are audiences, and Hollywood is wondering whether they will now start demanding escapist comedy and patriotic heroism of the sort that the studios served up in the second world war.

One clue may come from rentals of films on videotape and DVD, which rose in the days after the attack as people sought comfort in the safety of their homes. Video shops around Los Angeles reported that family films, such as Disney cartoons, were much in demand. Other choices were more startling. Besides a run on documentaries about Nostradamus, a medieval mystic, there was a spike in demand for thrillers involving terrorists. Mr Schwarzenegger may yet fight back.

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Business and terrorism

Taking stock

Sep 20th 2001
From The Economist print edition

Can it ever again be business as usual?

AP

Just-not-in-time

AS BUSINESSES around the world assess the impact of last week's terrorist attacks on America, they are dividing the issues into long-term strategic ones and short-term practical ones. In the short term, the main problems concern the movement of goods and of people. With security tightened at ports, airports and land borders, industrial goods are taking longer to reach their destinations. Trucks on the border between Canada and America have had to wait up to 20 hours for a crossing that normally takes minutes.

Managers and executives are moving less too. General Motors and Toyota banned all international travel by their staff for a while, once their people had got home from the Frankfurt Motor Show, which was taking place as the terrorists attacked. America's car industry will suffer anyway. The big Detroit manufacturers rely on a network of suppliers that stretches into the Canadian province of Ontario. DaimlerChrysler, Ford and General Motors were all forced to stop production until parts could be expedited through the border congestion. At an unprecedented meeting in Detroit on September 19th, industry leaders met trade unionists and a pair of cabinet members to rebuild confidence in the industry. All were concerned to keep open lines of credit and to avoid undermining consumer confidence by large-scale plant closures. Many analysts nevertheless say that further closures are inevitable.

For most other industries, shortage of inventory is not a problem. At present, American inventory levels are close to a record high. In the telecoms and computer businesses, in particular, firms have had excess stock for some time. Cisco Systems, the most spectacular example of overstocking, had to write down its inventory by $2.25 billion at the end of last year. Indeed, any bunching of semiconductor deliveries at west-coast ports might not be all that unwelcome.

Over the past ten years or so, companies have come to depend more and more on just-in-time (JIT) delivery of industrial inputs. Inventory arrives on the factory floor only as and when it is needed. Any perception of an increase in risk tilts the balance away from JIT and in favour of JIC, the “just-in-case” strategy of holding inventory against the risk of an unexpected disturbance in the supply chain. This balance has been tilted further by sharp falls in interest rates, which have cut the cost of holding inventory by more or less half, and thus reduced the need for JIT systems.

The big gainers from all this have been the freight companies and air-cargo businesses, such as Federal Express and UPS. And they are likely to continue to thrive once the short-term shock is over. Freight is less sensitive to terrorism than passenger travel. Even if American freight carriers were to copy El Al, Israel's airline, and hold goods for a day for security checks, it would not greatly erode the advantages of air freight over other means of transport.

Meanwhile, executives confined to their offices are taking to audio- and videoconferencing. Demand was up by 50% at some suppliers, and shares in Polycom, the biggest company in the business, shot up by 33% when American stockmarkets reopened on September 17th. But videoconferencing is not a new technology. Executives have cold-shouldered it in the past because they did not want to give up the pleasures of travel and the value of face-to-face meetings.

They are more likely to resort to land-based transport for journeys of up to 500 miles, and to make sure that “key-man” insurance policies are in place for the rest. Since the attack, Executive Jet, a company

that offers part-ownership of private jets, has been deluged with calls. Companies seem likely to make more use of corporate jets in future, so that their top people are not exposed to the risk of travelling with unknown fellow passengers. Other security practices introduced into multinationals' offices abroad—for example, electronic tagging of people and packages—are now likely to be exported to America.

Vince Tobkin, a San Francisco-based director of Bain & Co, a consultancy, says that the attack will also make companies think more carefully about duplication. Morgan Stanley was able to open for business this week because it had a duplicate back-up data centre located outside Manhattan. Many high-tech firms learnt a similar lesson when the 1995 Kobe earthquake in Japan wiped out some crucial suppliers to the semiconductor industry. They now have “dual sourcing”, two plants that can supply them with components in case one should go down. Mr Tobkin says also that many more companies will want to make sure that they have duplicated ways of connecting to the Internet.

Much of this is tinkering at the edges, or nudging along something that was taking place anyway. Nobody yet thinks that the terrorist attacks will have any deep and lasting effect on how America does business. An inevitable increase in freight costs is not going to wipe out the benefits of manufacturing in low-cost countries abroad. The semiconductor industry is not about to retrench to California. Even air travel will revive one day.

What might happen, however, is that the globalisation of American multinationals will be conducted more at arm's length. McDonald's is everywhere, but mostly in the hands of local franchisees. Attacking McDonald's in faraway places is an attack on America in name only. Likewise, more manufacturing is being outsourced by multinationals to specialist equipment makers. Whether they are in Indonesia or Bangladesh, they are (and look like) local companies. Only R&D, marketing and other high-value-added services remain in American hands.

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Water industry

Unquenched thirst

Sep 20th 2001
From The Economist print edition

Germany's RWE swallows America's largest listed water company

AFFLUENZA has long been a common affliction of European utilities. Although their core energy businesses generate cash in abundance, they offer few opportunities to invest. So, time and again, the utilities have diversified into loosely related activities, claiming to have discovered money-making synergies—only to divest again, disappointed, a few years later.

RWE, Germany's second-largest utility, thinks that it has found a cure for this old ailment: transforming itself into an international multi-utility, supplying electricity, gas and water. The concept sounds tempting. In any one place, suppliers of these services are likely to have much the same customers. So combining the businesses should save money in customer services, billing and payment collection. This week, RWE announced the latest stage of its metamorphosis: an agreed $4.6 billion bid (together with the acquisition of $3 billion of debt) for American Water Works, the largest listed water provider in the United States.

The problem is that RWE's businesses are all in different places. In America, it will become the country's largest water supplier, but American law will not let it buy regulated gas and electricity companies. In Britain, where it bought Thames Water last year, water is also likely to remain its sole offering. At home in Germany, RWE's strength is in energy. Its presence in the water industry, which is spread among almost 7,000 mostly municipal companies, is tiny: it has minority stakes in 19 municipal operators. It started to look abroad precisely because domestic opportunities were so limited.

With hardly any operational synergies, RWE's water ventures look suspiciously like diversification by another name. Granted, it is sloughing off its non-utility interests. Its telecoms and chemicals businesses have been sold, and it will probably dispose of its stakes in Hochtief, a construction company, and Heidelberger Druckmaschinen, a printing-machine manufacturer, in the next few years. Nonetheless, the stockmarket still treats it as a conglomerate, valuing the company at 30% below the sum of its parts.

Worse is the worry that RWE is frittering away the cash from its disposals on expensive foreign acquisitions. Some were kind enough to say that the 46% premium it paid for Thames Water was “strategic”; others thought that it was simply too big. Now it has offered 37% over the market price for American Water Works' shares.

Could this yet be money well spent? If so, the returns are more likely to come from developing countries than from fancy synergies between utilities in the rich world. In poor countries, demand for clean water is increasing rapidly, just as industrialisation is threatening supplies. The World Bank has estimated that annual investment might have to double to $180 billion to keep pace with demand. Meanwhile, governments are relying more and more on private companies to finance and build water infrastructure, in return for profitable long-term licences to run local monopolies. Industrial companies are increasingly outsourcing their water and sewage management to meet rising environmental standards.

With its strong balance sheet and American Water Works' well established brand name, RWE should be in a better position to take on the world's two biggest water companies, France's Vivendi Environnement and Ondeo, the international water subsidiary of Suez, in the battle for infrastructure contracts. Whether it will succeed in becoming a true multi-utility, though, is still open to doubt. And if it fails? Don't be surprised if it stops counting water as a core activity—and eventually sells what it has spent so much to buy.

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The Internet

Taxman.biz

Sep 20th 2001 | SAN FRANCISCO
From The Economist print edition

Will the Internet's address system be used to collect taxes?

IT HAS been business as usual in recent weeks for the Internet Corporation for Assigned Names and Numbers (ICANN), the body that oversees the network's address system: squabbling and controversy. Netizens complained that cybersquatters have already scooped up many of the best names ending in ".info", a new Internet domain which will go live on September 22nd, and the first of seven new suffixes that are supposed to alleviate the scarcity of online addresses. Nor has the introduction of ".biz", the second new suffix, due on October 1st, been any smoother. NeuLevel, its operator, is having to defend itself in court against charges that its pre-registration process amounts to an illegal lottery.

To make matters worse, there were heated debates at a recent ICANN meeting in Montevideo, Uruguay, about how to conduct future elections to the organisation's board. "There are limits to the amount of rubbish I can take," Carl Bildt, a former Swedish prime minister who is chairman of the relevant ICANN membership committee, was reportedly heard saying—a remark aimed at critics of the committee's proposal that only holders of domain names should be allowed to vote. In ICANN'S first and only election so far, in October 2000, anyone with a valid e-mail address could vote.

Some more interesting news from Montevideo, however, received much less attention. The Governmental Advisory Committee (GAC), a group of government representatives who convene behind closed doors during the quarterly ICANN meetings, had been talking quietly about the Internet's domain-name system and taxation. Speculation promptly broke out that governments are seriously considering what has so far been only corridor talk: the use of the Internet's infrastructure to collect taxes.

The reality is rather less earth-shattering. The GAC members heard a presentation by an OECD fiscal expert on how "Whois", an online service that allows users to find out who owns an Internet address, can be made more reliable, so that tax authorities can use it to gather information on e-commerce sites. Because an estimated 15% of e-commerce sites in the Whois database cannot be traced to a registered business or person, the OECD would like ICANN to get domain-name registrars to validate the information provided by their customers.

Yet the underlying question remains: could the underpinnings of the Internet, and in particular the IP addresses that identify computers on the web, also be used to collect sales taxes? Technical experts cringe at the idea. And indeed, the existing structure of the Internet hardly lends itself to equitable taxation. Only around 90% of users can be pinpointed. It is easy to avoid being tracked by using services that hide IP addresses, such as Anonymizer.com.

Yet this could change as technology evolves. Privacy advocates worry, for instance, that ENUM, a project to link the domain-name system with telephone numbers, will make all individual users identifiable. In the long run it should be easier to collect taxes in cyberspace than it is offline, at least in theory. Electronic transactions always leave a data trail—unless they use anonymous digital cash, which has so far failed to gain popularity. The OECD is already looking into how other data, such as the customer databases of online stores, could be used for tax purposes.

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Wall Street's reopening

Back, if not bullish

Sep 20th 2001 | NEW YORK
From The Economist print edition

That America's stockmarkets reopened relatively unscathed is more important than where they then headed

Reuters

A STOCKMARKET rally would certainly have lifted spirits battered by terrorist attack. A staged rally, on the other hand, would have sent entirely the wrong signal. So when New York's stockmarkets reopened on September 17th—after missing four trading days, the longest break since 1933—what better way for Wall Street to show the world that it is truly back to normal? Share prices fell steeply, in an unsentimental response to an event that was clearly bad news from an economic perspective, as well as from all others.

The reopening was an emotional affair, with speeches about the survival of capitalism, minutes of mournful silence, and members of the emergency services ringing the opening bell. Those fierce rivals, the Nasdaq market and the New York Stock Exchange, ceased their ancient hostilities, though perhaps not for ever. The efforts to ready Wall Street's shattered electronic systems to cope with record trading volumes were impressive indeed (see article).

Ahead of the reopening, “Bullish on America” became the rallying cry of a new breed of investor, dubbed the “patriotic buyer”. E-mails circulated urging people to “surprise our enemies by showing our confidence in America and...by buying shares of your favourite stock or mutual fund.” Some prominent individual investors promised to do just that; others promised to deploy for the cause money that they managed for third parties. Carl McCall, New York state's comptroller, pledged to invest $1 billion of the state's pension fund in equities during the week.

Many companies said they would buy back their own shares to support prices. (Whether they actually did this is unclear: announcements of share repurchases are famously non-binding.) Rumours circulated that a gentlemen's agreement bound Wall Street's investment banks not to take advantage of one another, and that the shorting of shares would be discouraged. Hedge funds, in particular, would face moral—or worse—strictures from the investment banks against pushing the market down.

In keeping with the mood, shortly before the markets reopened the Federal Reserve cut short-term interest rates by half a percentage point. It was a move clearly timed to prop up share prices—though, equally clearly, it was also a response to the weakness of the American and world economies. This is the eighth Fed cut this year, and the federal-funds rate, at 3%, is now at its lowest since 1994.

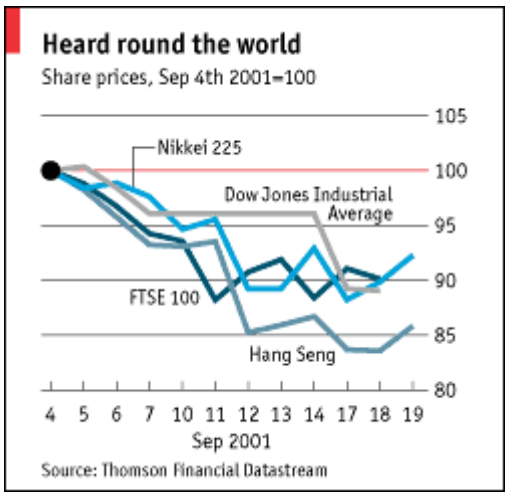
In the ensuing hours and days, other central banks around the world followed, including the European Central Bank (which cut by half a point), the Bank of England (by a quarter-point) and the Bank of Japan (by rather less, but then short-term rates in Japan are close to zero anyway). Prices of fed-funds futures suggest that investors expect American interest rates to fall quickly to 2.5%, and to remain at that level until the middle of next year. Immediately before the attacks, the futures markets were predicting a quarter-point cut, to 3.25%, with rates then starting to rise next year as an economic recovery gathered pace.

What to everybody but the central bankers themselves looked like a co-ordinated round of cuts seems to have partly reassured investors, who had feared that the Fed would be alone in reducing rates. The reassurance seems to have stabilised, for now, the level of the dollar against other major currencies. In the days following the attack, the dollar fell by little more than 2% in trade-weighted terms—rather less than analysts had expected.

Share prices, on the other hand, fell steeply—though seemingly in rational ways. There was little evidence of panic selling; individual investors appear to have been particularly stoical. Reports differ about the fate of the banks' gentlemen's agreement—but if it survived the first day, it did not last the second. As for leaning on hedge funds, there are now so many (and most are so small) that, as Jeffrey Tarrant, a longtime investor in hedge funds, puts it, “it is not clear how you could orchestrate them if you wanted to, or how to enforce a pact if one was made.” Equally, funds now follow so many different investment strategies that it is unlikely they could ever act in concert as the main force driving down share prices.

All the same, the blue-chip Dow Jones Industrial Average did suffer what arithmetically challenged pundits called its biggest single-day loss on September 17th—dropping by 684.8 points, to 8,920.7. In percentage terms, a 7% fall was modest as historically bad days go. Still, it took the Dow to more than 20% below its peak in January 2000, making this officially a bear market, the last of the main American share indices to achieve that distinction. On September 18th, the Dow continued its slide, as did most big markets overseas (see chart).

On average, greater uncertainty about the outlook for the economy ought to increase the riskiness of shares. So one might expect the result to be lower prices across the board. Individual share movements, too, have plausibly reflected the likely losers, and occasional winners, from the terrorist attacks. Airline and insurance companies fell sharply; defence shares and some New York property-investment trusts rose. As the political debate raged to and fro about how much taxpayer money to shower on shareholders (of airlines, notably), prices moved accordingly.



Where will the market go from here? Even after this week's tumble, the price/earnings (p/e) ratio of most American shares still looks high, since the outlook for profits has deteriorated faster than share prices have fallen. Since the attacks, many firms have issued warnings that their profits will suffer. Much will depend on whether investors decide collectively that now is the moment to bring share prices back to historically typical p/es.

Perhaps they will decide not to. The psychology of investors seems still to be more bullish than tumbling share prices this week at first suggest. They appear still to regard equity investment as broadly a good thing, even if they think that last week's disasters point to lower share values. Developments in the “war” against terrorism could change this—or, if all goes well, reinforce it. No doubt, there will be rallies and declines. That, after all, is what business as usual in the markets is like. It is good to have them back.

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Wall Street's running repairs

The markets rewired

Sep 20th 2001 | NEW YORK
From The Economist print edition

The battle to resurrect Wall Street is being fought underground

EPA

Downstairs looked much the same

HORRIFIC as the attack on the World Trade Centre was, the devastation to financial markets came, with hindsight, not from the terrible loss of life in lower Manhattan, nor from the destruction of property. Markets seized up when the vast sheath of wires that lie beneath the financial district cracked, and when telephone lines—millions of them—went dead.

There was no financial panic. When markets suddenly shut on September 11th, the companies that were hardest hit were those rolling over commercial paper, the kind of short-term loans granted to the most solvent borrowers. The credit crunch that could have emerged was pre-empted by the Federal Reserve, which provided almost $100 billion in liquidity, by giving commercial banks direct access to funds through its discount window, and helping security firms through repurchase operations. On a subtler level, regulators encouraged commercial banks to lend: they were tolerant, for instance, about rules such as the strict maintenance of capital ratios. As a result, money has been abundant and cheap for most of the past week.

There was one crucial shortage, however: linkages among firms. Lower Manhattan, it has become clear after September 11th, may be the world's largest single electronic marketplace.

Proximity still plays a big part in the way finance operates. Mergers are negotiated, investment ideas pitched, and employment auctioned—all through face-to-face meetings. Transactions are another matter. In the days when banks' vaults were full of bearer bonds and stock certificates transferred by “runners” after trades were done, trading firms had good reason to cluster together. Within just a few blocks of the New York Stock Exchange are the headquarters of Merrill Lynch, Lehman Brothers, the Bank of New York (a large custodian bank) and the flagship branch of the Federal Reserve.

Yet proximity is today of little or no help in implementing trades. Indeed, when the lines went down, all suffered. Bank of New York was hit particularly hard. It struggled to make payments, signal fund transfers, and clear and settle securities, because its main processing centre and its main back-up were both near the collapsed towers. The bank succeeded. On the whole, contingency plans on Wall Street, including firms' much-vaunted “disaster recovery centres”, proved adequate—but only barely so.

Within a day, thousands of employees at each of these firms had been found new offices. Lehman Brothers took 665 rooms in a mid-town hotel owned by a client. Merrill bought and installed an entire phone system to boost capacity in its New Jersey facilities. The New York Fed also moved its market operations to New Jersey. Mid-town firms lent office space to friends or clients. Big banks met daily, agreeing to extend the hours for dollar-based payment systems. Even away from Wall Street, computerised operations slowed to 70% of their usual speed, because of capacity constraints. This delayed reconciliations—though, remarkably, regulators say that all clearing got done.

The company that emerged as the most important link in the financial system was Verizon, the phone utility that covers America's north-eastern seaboard. Although the company lost five staff in the New York attack (and one more in the Pentagon), for whom it desperately searched, Verizon set about rebuilding one of the largest telecoms networks in the world—and did it swiftly, even in the middle of a disaster zone.

The task only got harder when a building across from the two giant towers, Seven World Trade, collapsed into 140 West Street, the phone company's old headquarters that contained a huge switching facility, with 3.5m data circuits and 200,000 voice customers. The building still stands, in part, because one brave person stayed behind to shut down its gas supply and other mechanical operations.

As this was going on, call volumes spiked, at moments to ten times average levels. Computers with dedicated connections to machines in the World Trade Centre clogged lines by continually redialling. Each has had to be reprogrammed individually, a task that continues. Spare generators and cellphone relay stations, salted throughout the region for disasters, were dragged out, along with 400 cellular pay phones which, with the rest of Manhattan's pay phones, were programmed to operate free of charge. Some 5,000 Verizon employees took part in the reconstruction.

Hospitals and emergency centres got the highest priority for reconnection, but financial firms came second, thanks in part to the determination of Dick Grasso, head of the New York Stock Exchange. By September 14th, 140 West Street was accessible once more. On Saturday, equipment was coming in and cables were coming out—of windows if need be. By Monday, the New York Stock Exchange was able to reopen, with record volume—although getting through to many firms remained a challenge. Still, of the 15,000 circuits used directly by the exchange, more than 14,000 were operating and more were added every minute; most of the 3.5m data connections also worked. Within a week, says Larry Babbio, Verizon's vice-chairman, the system will be “close to normal”. For perhaps the first time in history, New Yorkers were cheering the company's vans.

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The insurance bill

What's the damage?

Sep 20th 2001 | NEW YORK
From The Economist print edition

Promises by insurers to settle claims quickly look premature

THE size and complexity of insurance claims after last week's attack on the World Trade Centre (WTC) break new ground. Estimates for the total cost to the insurance industry start at around $30 billion, with Lloyd's of London set to take the biggest hit. Nor are the liabilities easily untangled. The attack affected financial firms—some turning over billions of dollars daily—for several days. Thousands of workers who survived will seek compensation for lost wages and for physical and psychological damage.

European and American insurance firms said they were willing to settle claims quickly, and some even started to announce estimated losses the day after the attack. Life-insurance claims are relatively easy to assess. Over 5,000 people are dead or missing. They may have had corporate life insurance, key-man insurance (for executives vital to their firm), private life insurance, or all three. Corporate life insurance is usually two or three times the annual salary. Key men are insured for $1m-5m, but this policy is more common for small firms, not those on Wall Street. Private life-insurance policies are individually different, but Moody's Investors Service estimates the overall cost for life insurers at $2 billion-5 billion.

Non-life insurance firms will face higher claims. The two WTC towers were insured for $3.2 billion, the airlines whose aircraft crashed into them were insured for $1.75 billion per event, and there will be smaller property and casualty claims. Estimates for workers' compensation and business interruption are the big unknowns. Almost all workers in New York are entitled to workers' compensation. It covers medical expenses and about two-thirds of a worker's weekly wage (tax-free) for as long as he is unable to work. Coverage of business interruption usually comes with property insurance.

Most claims will settle in the next few months, but many will not close for years, or even decades, says Robert Hartwig at the Insurance Information Institute. And, this being America, there will be lawsuits. Although the Association of Trial Lawyers of America, a group of personal-injury lawyers, called for an indefinite moratorium on civil suits related to the attack, its members are unlikely to turn away potential clients for long.

Lee Kreindler, an aviation lawyer, has already been hired by five families. Mr Kreindler won $500m for families of passengers in the Boeing 747, owned by Pan Am, that was destroyed by a bomb over Lockerbie, Scotland, in 1988. But at Lockerbie only Pan Am and its security contractor were held to blame by civil courts. This time, lawyers suggest, awards could reach billions of dollars, for there is a long list of candidates besides the airlines, which may be sued for $1 billion per hijacked jet—and perhaps more, if families of those killed on the ground join.

The other candidates include airport security firms, whose employees let armed terrorists slip through, and Boeing, which built the planes. Lawyers may also try to pin blame on the Silverstein consortium (which leased the WTC), the Port Authority of New York & New Jersey (which owned it), or even the towers' architects and builders. Other possible targets include the Federal Aviation Administration, which trains air-traffic controllers, and the Massachusetts Port Authority, which oversees Boston's airport, where the two groups of hijackers boarded.

Once the first shock is over, insurers may try to duck claims, arguing that they do not cover acts of war. Aetna Casualty & Surety initially refused to pay claims for the victims of Lockerbie, because the bombing was a “warlike” action. An appeal court, however, ruled that an act of war must be committed by a sovereign state. Yet this time the insurance firms appear to have an ally in President Bush, who branded the WTC attack an act of war. When it comes to paying, the insurers will say no, says Eugene Anderson at Anderson Kill & Olick, a law firm that specialises in suing insurance firms.

Warren Buffett, Omaha's best-known financier, has already turned the president's words to advantage. He backed away from a tender offer for Finova Group on Monday, on the ground that last week's attack was an act of war. Berkshire Hathaway, Mr Buffett's insurance-oriented conglomerate, is facing a hefty bill for the attack, perhaps some 3-5% of the eventual total, he says. Shelving a tender offer, however, is one thing. Ducking insurance claims related to such a vast tragedy could really backfire on America's favourite investor.

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Cantor Fitzgerald

Carrying on

Sep 20th 2001 | NEW YORK
From The Economist print edition

Never has a firm lost so many staff

AP

WHEN the Treasury-bond market reopened just two days after the attacks, both Cantor Fitzgerald and eSpeed were up and running. It is hard to exaggerate the courage that this involved. The two sister firms had their main offices above the 100th floor of One World Trade Centre. Nobody who was at work survived. Some 700 out of 1,000 New York staff are feared to be dead.

The firms resumed business through operations in London and a back office in New Jersey. Surviving employees returned to work, partly to keep the firm alive and so help the families of those who died, and partly because it was too painful to stay at home.

Cantor was founded in 1945 by Bernie Cantor, once a hot-dog vendor at Yankee Stadium who went on to own the world's largest collection of Rodin sculptures. The firm became the leading “inter-dealer broker” in the government-bond market, acting as middleman in bond trades between big securities firms. Much of the government-bond market is relatively illiquid, so a middleman is needed to bring together buyers and sellers. In 1972 Cantor started to sell its bond data. That grew into the Telerate system now on every trading desk.

At its peak, Cantor's bond-trading floor, full of shouting brokers, was one of the wonders of the financial world. Recently, electronic systems have taken over. Cantor had a 90% share in the market for American Treasury bonds. In 1998 the firm launched the Cantor Financial Futures Exchange to take on the traditional floor trading at the Chicago Board of Trade. That year Cantor transacted over $45 trillion in trading volume, in more than 40 marketplaces, with revenues of more than $500m. In 1999 Cantor launched eSpeed, to allow electronic trading of financial instruments. The venture went public later the same year, with more promise than most business-to-business exchanges.

Among the victims were Doug Gardner and Fred Varacchi, who led the development of eSpeed. Their loss will add to the horrendous challenge facing Howard Lutnick, the chairman of both firms, who lost his brother and himself escaped death only because he had been taking his son to kindergarten.

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Emerging economies

Ill winds

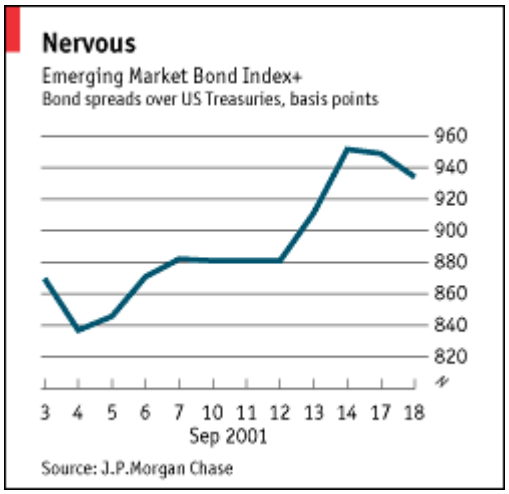
Sep 20th 2001
From The Economist print edition

How much worse will it get?

WITH rich countries reeling, emerging economies can do little but hold tight and hope. Their problems may vary, but last week's attacks will harm all of them in one way or another: whether through rising bond yields, falling exports, or more jittery visitors and investors. The saving grace for some might be shifting geopolitics, which could bring aid and lower debt burdens to America's new allies.

Debt worries have become starker. Investors were already demanding stiff premiums to buy emerging-market bonds. Those premiums have now risen again (see chart). Yields on Argentine government bonds jumped this week to more than 16 percentage points above those on American Treasuries. That puts them back where they were in early August, before the IMF stepped in with its $8 billion rescue plan. The setback is rattling Argentina's neighbours. Brazil may have joined it in recession in the third quarter; and Mexico, already in recession, depends heavily on American demand.

Since a currency board pegs Argentina's peso to the dollar, it could yet benefit if the greenback continues to slide. Moreover, none of the governments of the three biggest Latin American economies will need much new finance for the rest of the year. But if investors do not regain an appetite for risk by next year, Argentina could yet be forced to seek another bail-out, and Brazil could face a crunch. The IMF's boss, Horst Köhler, says that “It is premature to announce big new programmes.”



Although high debt burdens abound in other regions as well, weak export demand poses an even bigger threat to many emerging economies—especially in Asia. America's slowdown began with a steep drop in technology investment, which was already hurting Asia's export-driven economies. Singapore's non-oil domestic exports fell in August by 30% compared with a year earlier, the biggest drop ever. South Korea, Malaysia, the Philippines and Taiwan have all seen demand evaporate. Now the region faces fewer air passengers, a blow to countries such as Thailand that rely heavily on tourist revenues.

Along with fewer capital flows and exports, two other factors will affect emerging markets, although in different ways. One is the price of commodities, especially oil. Always a worry in bellicose times, the outlook for oil prices is even murkier this time around. Several Gulf states promise to release oil reserves to prevent a supply squeeze; and slumping demand worldwide (especially for air travel, which accounts for around a tenth of America's oil consumption) could also hold oil prices in check. Yet the initial spike in oil prices following the attacks will still worry many developing countries, since energy accounts for a bigger share of their cost base than it does in rich countries.

Another issue is what attitude official creditors take to troubled Muslim countries. Two to watch, besides Pakistan, are Indonesia and Turkey, a pair of moderate Muslim countries with secular governments. On September 17th Kemal Dervis, Turkey's economics minister, declared: “Western allies should consider the cost that Turkey will have to bear.” Mr Köhler responds tartly: “It is premature to hear from newspapers that Mr Dervis wants more money from the Fund.”

On September 19th, Indonesia's president, Megawati Sukarnoputri, was in Washington on a trip scheduled before the attacks. Although she faces pressure from Islamists at home, Miss Megawati offered support to America. That may help her country to reschedule debts with Paris Club creditors. Yet however

much help western governments give to moderate Muslim countries, private investors may undo it as they head for the exit.

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Japanese banks

Abandon hope

Sep 20th 2001 | TOKYO
From The Economist print edition

Their condition only gets worse

AP

Last straw for the Nikkei

THE attacks on America and their effect on financial confidence have exacerbated an already grim situation at Japan's commercial banks. The country's worsening economy means that more companies will go bust, adding to the banks' huge pile of bad loans. Falling stockmarkets mean that Japan's biggest banks are sitting on ¥5 trillion ($42 billion) or so of paper losses on equity holdings. These losses must be subtracted from banks' capital at the end of September, when books close for the first half of the financial year. The Bank of Japan's cut in its discount rate this week may have been aimed as much at helping the banks through this period as at supporting other central banks' easing.

For the banks remain woefully undercapitalised. Officially, the big banks have some ¥23 trillion of “tier one”, or core, capital. That yields capital-adequacy ratios of about 11%, well above the 8% that international rules require. Yet looks deceive. Banks can count ¥6 trillion of public money they received three years ago, but have promised to repay. Another ¥5 trillion is in the form of deferred taxes. Then comes ¥2 trillion of “profits” made from revaluing property when prices were higher. Subtract these sums, plus the equity losses, and banks have only some ¥5 trillion of capital, giving a capital-adequacy ratio of just 1.4%. Should equities fall further, this number would be even smaller.

The collapse on September 14th of Mycal, a supermarket chain with debts of ¥1.7 trillion, was a fresh blow for banks. There had been plenty of warning signs, yet lenders failed to classify Mycal as “in danger of bankruptcy”, a category that requires banks to provision against at least 70% of their loans. Provisions for loans to Mycal were less than 15%. Now banks must write off 100%. Worst-hit are Dai-ichi Kangyo Bank (DKB), Fuji Bank and the Industrial Bank of Japan (IBJ), which form the Mizuho Financial Group. The three biggest lenders duly gave warning of large losses.

Mycal's collapse was not the start of a co-ordinated process of write-offs and structural reforms that markets had hoped for. It was a bail-out gone wrong. Almost to the end, DKB took on loans called in by other banks less sanguine about Mycal's prospects. According to Teikoku Databank, DKB increased its loans to Mycal by almost 60% in the five months to July. It then handed it another ¥50 billion a month before its collapse. The bank could now face a lawsuit from shareholders.

Banks are just as badly under-reserved for other weak, big borrowers. A fresh injection of public funds does not look far away. But the government is in a bind. The only funds it can use are ¥15 trillion set aside in the event of “systematic” risk. But calling on these would be an admission of financial crisis, something the government badly wants to avoid. In any case, using public funds as it has done to date—with neither management nor shareholders taking responsibility, and banks not being forced properly to clean up their books—would be just one more stop-gap measure, damaging the banking system rather than repairing it.

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Trade talks

Looking hopeful

Sep 20th 2001 | WASHINGTON, DC
From The Economist print edition

A silver lining?

AMID all the gloom over the world economy, trade policy may offer a glimmer of good news. To little fanfare, the World Trade Organisation (WTO) on September 15th agreed on the terms of China's entry—after 15 years of negotiations. A few days later, the terms for Taiwanese accession were also settled. WTO ministers need to rubber-stamp the package. But with luck, the world's most populous country—and ninth-biggest exporter—really should be a WTO member early next year.

There is also renewed determination to launch a trade round at the ministerial meeting in Doha, Qatar, in November. Trade ministers have been keen to quash rumours that the meeting will, like those of the IMF and World Bank, be cancelled. Robert Zoellick, America's trade supremo, Pascal Lamy, his European counterpart, and Mike Moore, the WTO's director-general, have all said that the meeting must go ahead. And, though there are still big differences between countries over the agenda, the odds of agreeing on launching a round have risen.

There is a renewed sense of solidarity among trade negotiators: everybody realises that a new round would send a powerful signal that global integration will continue. Moreover America, in particular, may be less rigid in some of its demands. A bone of contention between rich countries, particularly America, and many poorer ones, is the “implementation” of commitments from the previous Uruguay Round. A group that includes Pakistan, India, Indonesia and Egypt has long argued that many provisions from the Uruguay Round must be revisited before a new trade round is launched.

Now, given the strategic role that many of these countries play, it is hard to see the Americans remaining quite so rigid on implementation. As Mr Zoellick puts it: “We need an economic strategy that complements our security strategy.” After Megawati Sukarnoputri's supportive visit to Washington this week, America looks set to offer Indonesia, the world's biggest Muslim country, new trade concessions.

The atmosphere on Capitol Hill is improving too. The Senate is speeding up passage of a free-trade agreement with Jordan. The administration has appealed to Congress to pass trade-promotion authority, which George Bush needs to complete trade deals. With luck, America's lawmakers will now pay heed.

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Economics focus

The wages of war

Sep 20th 2001
From The Economist print edition

What does economic history teach about natural disasters and war?

THINKING about growth and investment patterns at a time of terrible human suffering is the sort of thing that gives economics its dismal name. Yet understanding the economic effects of natural and man-made disasters can also help to minimise their impact. So economists and investors have been scouring history in the wake of last week's attacks, looking for lessons from previous calamities.

Disasters destroy some of the basic elements of an economy. The loss of human lives and capital reduces the quantity of goods and services produced and consumed. A less predictable effect comes through investments made to rebuild the capital stock and, even more significantly, through longer-term changes in consumer spending—which accounts, in America, for two-thirds of GDP.

In brute terms of lives and property lost, the terrorist attacks are somewhat akin to natural disasters such as floods, hurricanes and earthquakes. Two of the biggest earthquakes in recent memory shed some light: California's earthquake in 1994, which killed 50 people and caused $40 billion of damage, and the Kobe earthquake of January 1995, which killed 6,500 people and cost $150 billion.

When the Kobe earthquake struck, the Japanese economy had stagnated for three years. According to Edward Lincoln of the Brookings Institution in Washington, DC, short-term concerns for the Japanese economy were calmed within a week, as most factories, unlike the ports and highways, were found to be intact. But soon afterwards, a terrorist nerve-gas attack on the Tokyo underground left 12 dead and 5,500 ill. The attack struck fear into city-dwellers; consumer confidence fell sharply. Still, worries that the damage from these two incidents would drag Japan deeper into recession turned out to be overdone. In fact, the economy grew by 1.6% in 1995—helped, admittedly, by some government fiscal stimulus.

California did even better after its earthquake. At the time, the state was struggling to recover from America's recession of 1990-91. California's aerospace and defence industries had suffered greatly after the Soviet Union's collapse and the end of the cold war. Mudslides and forest fires that followed the earthquake appeared to be the final straw. Yet, surprisingly, this turned out to be the beginning of a long boom. Between 1995 and 1999, California's economy grew at an average annual rate of 6.9%.

In its preparations for a possible millennium bug, America's Council of Economic Advisers studied the economic effects of more than two dozen natural disasters in the country since 1970. They found that none of them, including Hurricane Andrew in 1992, which destroyed assets equivalent to 1% of GDP, had had any discernible effect on growth beyond the quarter in which they occurred. A caveat here, though: part of this welcome outcome may be down to the way GDP is calculated. Destruction of a country's capital stock has no effect on GDP, while rebuilding that stock counts as income.

One big worry today is that tightened security precautions could weaken the economy by hampering the transport of goods. Evidence from Kobe and from a big strike in 1997 by American employees of United Parcel Service, provide some reassurance. In both cases. companies found other means of shipping cargo and parcels. The claimed flexibility of rich, modern economies does seem to make them more resilient.

A war dividend?

Earthquakes and labour unrest are a long way from being perfect analogies to America's declared “war” against terrorism, of course. Natural disasters are short-term in duration, and geographically limited in impact. Wars are potentially different, in both scale and duration.

After Iraq invaded Kuwait in August 1990, American consumer confidence slid steeply, and oil prices soared. Much like today, the American economy was suffering from slow growth and a slump in investment, although interest rates were more than twice today's levels, and oil consumption was a larger share of GDP. The Gulf crisis helped to push an already weak economy into recession.

War, or the prospect of it, makes the climate for private investment far murkier, by upending established patterns of consumption and production. One way of measuring this disruption is through the “equity risk premium”, the rate that investors demand to compensate them for putting their capital in risky shares rather than in “safe” government bonds. The risk premium is a measure of investors' views about shares' expected returns: if war makes profits and dividends less certain, investors bid down share prices relative to bonds, in order to reflect the risks inflicted on business activity.

A recent analysis by Morgan Stanley calculates the equity risk premium before and during the second world war. It more than doubled, to 9%, between 1937 and the evacuation of Dunkirk in June 1940; but it then fell until the end of the war. Smaller but similar gyrations in the risk premium were seen during the Cuban missile crisis, the 1973 oil embargo and the Gulf war of a decade ago.

Government spending, on the other hand, typically shoots up in wartime. It is widely credited, during the second world war, with removing the last vestiges of the Great Depression. It also fuelled booms during the Korean and Vietnam wars. A massive increase in spending on airport security, border controls and a military build-up in America may yet have a similar effect. Bear in mind, though, that previous booms followed the mobilisation of traditional armies and navies. A large anti-terrorist conflict could provide many of the risks of war without any of the offsetting benefits.

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Security technology

Watching you

Sep 20th 2001
From The Economist print edition

What security technology can—and cannot—do about terrorism

IN THE wake of last week's terrorist attacks on New York and Washington, all kinds of fancy machines—from facial-recognition databases to advanced luggage scanners to glorified autopilots—have been proposed as technological fixes in the fight against terrorism. So what do such technologies have to offer?

One popular option is biometrics. A biometric is, as its name suggests, a measurement of a biological characteristic. Fingerprints are the best-known example, but others include hand geometry, iris scanning and facial recognition. Because biometrics cannot be lost, forgotten or passed from one person to another, and are hard to forge, they are already used widely as security measures.

Biometric systems are employed for two main purposes. The first is identification ("who is this person?"), in which a subject's identity is determined by comparing a measured biometric against a database of stored records. The second is verification ("is this person who he claims to be?"), which compares a measured biometric with one known to come from a particular person. All biometrics can be used for verification, but only those that are unique to an individual—notably fingerprints, iris scanning and facial recognition—can be used for identification. As a result, different biometrics are used for different kinds of security check.

Biometrics are widely employed for access control—to ensure that only authorised people can gain entry to particular rooms or buildings. Hand-geometry systems, which measure the shape, size and other characteristics (such as finger length) of some or all of the hand, are used to control access and check identities at airports, offices, factories, schools, hospitals, nuclear-power plants and high-security government buildings. Since hand geometry is a verification not an identification technology (people's hands are more similar than their fingerprints), users are required to make a claim about who they are—by swiping a card, for example—before a scan. The biometric template of the person they claim to be (which can be stored on the card itself) is then compared with the scan.

A well-known example of the technology is the INSPASS programme, which allows frequent travellers to the United States to skip immigration queues at large airports by swiping a card and placing their hand on a scanner. In theory, this idea could be extended to require passports to contain a hand-geometry biometric, which could be compared with the holder's hand. That would make passports harder to forge. But it would also require international agreement and co-operation over biometric standards.

The human factor

There would appear to be considerable scope for wider use of access-control technology. In security tests carried out at 83 airports last year by America's Federal Aviation Authority (FAA), attempts to gain access to secure areas succeeded 31% of the time, and inspectors successfully boarded planes in 82 cases. But a report published by the Department of Transportation found that most of these security violations were due to human factors: airport staff failed to ensure that doors closed properly behind them, and did not challenge people they met in unauthorised areas. Biometrics cannot do anything about that. This summer, the FAA proposed new rules under which airport staff could be fined as much as $11,000 for holding doors open for others, or allowing friends into secure areas.

Another biometric technology that is starting to appear in airports is iris scanning. This is used in dozens of jails in America to identify prisoners, staff and visitors, ensuring that the right people are let in and out. Iris scanners have also been tested by banks in a number of countries to identify users of cash machines. Since the iris scan identifies each customer, there is no need to insert a bank card or remember a personal identification number.

Iris scanners are being tried out in several airports to let frequent flyers step up to a machine and get their boarding cards automatically. But all this does is to make it more likely that the person who gets on a plane is the rightful ticket-holder. The terrorists responsible for last week's attacks appear to have travelled under their own names and with their own passports. Iris scanners would not have stopped them.

Facial recognition, on the other hand, is unique among biometrics in that it can be used passively—in other words, an image of a face can be compared with a database of suspects without the subject's knowledge. Such systems, connected to a network of closed-circuit television (CCTV) cameras, are already used to spot criminals and football hooligans in Britain. This summer the same technology was installed at Keflavik airport in Iceland.

Joseph Atick of Visionics, a firm based in New Jersey that is one of the leading suppliers of facial-recognition technology, points out that iris scans and fingerprints were not available for last week's hijackers, but pictures were. One of the hijackers, he says, was caught on videotape at a Malaysian airport meeting members of the group that attacked the *USS Cole* in Aden harbour last year. “What we need to do is to build an international counter-terrorist database with pictures and faceprints for every dangerous individual,” he says. As well as passively scanning airports for known suspects, he suggests that everybody should be required to have a close-up facial scan as they check in, “just as your credit is checked when you buy something with a credit card.”

Facing reality

The traditional objections to facial-recognition systems—that they violate privacy, and could end up being used to pick out people with overdue parking tickets, as well as terrorists—are likely to be drowned out in the fearful atmosphere following last week's attacks. But according to Richard Smith of the Privacy Foundation, a lobby group based in Denver, Colorado, even if facial-recognition systems were in place, the technology would not be a silver bullet. Most of the hijackers, he notes, were not suspected terrorists, so no pictures of them were available. And in the case of the two who were suspects, attempts to track them down had begun only a few weeks before the attack. He concludes that a breakdown in communications, rather than inadequate technology, is the problem.

Another technology that has been the focus of renewed interest is advanced forms of luggage scanner, such as three-dimensional scanners, remote scanners that can look at people at a distance, and scanners with “threat image projection” (TIP). The idea behind TIP is to keep luggage screeners on their toes by randomly projecting a fake “threat image”—in other words, a picture of a knife, gun or explosive device—into occasional items of luggage. When the screener presses the “threat” button, the fake image is removed, and the luggage can be checked again for real threats. In this way, it is possible to monitor the performance of individual screeners. TIP-capable luggage scanners are now being installed in America's largest airports.

But however clever scanning machinery becomes, the real problem, once again, is human. Luggage screeners are paid little, and the work is tedious, so that it is hard to concentrate for long. Research by the FAA, which has not been published in detail for security reasons, found that screeners' ability to detect suspect objects is not improving, despite the new technology.

In any case, last week's hijackers seem to have used weapons that would not have been picked up as threats by existing scanners. A really determined hijacker, notes Frank Taylor of the Aviation Security Centre at Cranfield University in Britain, could use almost any blunt object, or even a piece of in-flight cutlery, as a weapon. Already, some airlines have switched to plastic cutlery as a precautionary measure.

Faced with terrorists who may not be carrying weapons, and are travelling under their own names, another technology that might help to identify them is computer-assisted passenger screening (CAPS), which was first introduced by a number of American airlines in 1998. CAPS uses information from the reservation system, and a passenger's prior travel history, to select passengers for additional security procedures. It has been fiercely criticised by civil-liberties campaigners who accuse it of picking on

members of particular ethnic groups or nationalities.

Besides, terrorists expect to be questioned at check-in, says Mr Taylor. He suggests that CCTV surveillance should be extended to cover passengers “away from areas where they expect to be observed”. Some of last week's hijackers were reported to have had an argument in the car park at Boston airport. But Mr Taylor admits that this process could not be automated. There would also be privacy implications, plus the usual accusations of bias.

On autopilot into the future

If spotting terrorists on the ground is so hard, what can be done to make aircraft harder to hijack in the air? Again, there has been no shortage of suggestions. Robert Ayling, a former boss of British Airways, suggested in the *Financial Times* this week that aircraft could be commandeered from the ground and controlled remotely in the event of a hijack. The problem with this, says Mr Taylor, is that remote-control systems might themselves open aircraft up to hijacking by malicious computer hackers.

He suggests instead that automated landing systems should be modified so that, in the event of a hijack, the pilot could order his aircraft to land itself, with no option to cancel the command. Another idea is that existing collision-avoidance and terrain-avoidance systems could be modified to prevent aircraft from being crashed deliberately. But such proposals, says Chris Yates, an aviation-security expert at *Jane's Defence Weekly*, belong “in the realms of science fiction”. (Mr Yates advocates simpler, low-tech fixes, such as doing away with curbside and city-centre check-ins, and allowing only passengers to have access to departure gates.)

In short, for every quick fix, there is an unseen drawback. Clever gizmos can do only so much, and they may also provide a dangerous illusion of invulnerability. No matter how advanced the technology, it has to be backed up with skilled personnel and appropriate procedures. Until now, people's priorities when travelling have been convenience and price, not security. That may change. But the reality is that no technology can neutralise the threat of terrorism. Indeed, nothing ever can.

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GM crops and insects

Butterfly balls

Sep 20th 2001
From The Economist print edition

Genetically modified maize is not that bad for monarchs

SOMETIMES it takes a hammer to crack a nut. The nut, in this case, is the idea that maize that has been genetically modified to protect it from maize-eating insects poses a threat to non-maize-eating insects. The hammer is a set of six papers, written in collaboration by 29 researchers, and published on the website of the *Proceedings of the National Academy of Sciences*.

These papers, paid for in part by the Agricultural Biotechnology Stewardship Technical Committee, an industry body, were co-ordinated by May Berenbaum of the University of Illinois, Urbana-Champaign. They were stimulated by work by John Losey and his colleagues at Cornell University that was published two years ago in *Nature*. Dr Losey (who is one of the authors of the new papers) showed that the larvae of monarch butterflies could be poisoned by maize pollen containing a natural insecticide engineered into the DNA of the plant that produced the pollen. The inference widely drawn by the press and by opponents of genetic modification, though not by Dr Losey himself, was that monarchs were at risk in the wild.

The insecticide is a protein called Cry, normally produced by a bacterium, *Bacillus thuringiensis* (known, for short, as *Bt*). It affects only the larvae of butterflies and moths, and it is put into maize to ward off a moth called the European corn borer. Cry is produced all over the plant, including in its pollen. Since maize is wind-pollinated, there is a chance this pollen might blow on to other plants and therefore poison benign, or even desirable, insects.

The caterpillars of monarchs—a showy, migratory species that passes through, and breeds in, America's mid-western “corn belt” on its way to and from its winter hibernation grounds in Mexico—were thought to be at particular risk. The caterpillars' food plant, milkweed, often grows near maize fields. When Dr Losey dusted the modified pollen on to milkweed, and fed it to monarch caterpillars, many of them keeled over. No great surprise there. If you force-feed an insect with an insecticide, it may well die. The question is whether that is a genuine indication of a real threat to the wild population.

The answer, monarch-lovers everywhere will be pleased to know, seems to be no. First, the amount of Cry found in maize pollen varies from strain to strain; Dr Losey may have been unlucky in his original choice, and picked a particularly toxic one. The paper in which Richard Hellmich, of Iowa State University, Ames, took the lead, reported that the pollen of only one commercial strain consistently affected caterpillars. That strain accounts for less than 2% of maize planted in America, and is being withdrawn.

Even if the pollen gets on to milkweeds, the paper co-ordinated by John Pleasants, of Iowa University, showed that it tends to collect on the middle leaves of the plants, not the upper ones—which are where monarch caterpillars tend to feed. To back this up, laboratory and field studies reported by Mark Sears, of the University of Guelph, in Ontario, all failed to show toxicity at the sort of pollen densities actually found in the wild.

Lastly Karen Oberhauser of the University of Minnesota took the lead in pointing out that standard insecticides and weed-control practices, which have been used for decades, are as likely to affect monarchs as any putative GM crops would be. Indeed, the paper by Diane Stanley-Horn, who also works at Guelph, showed that in field trials, lambda-cyhalothrin, a common commercial insecticide, is far more destructive of monarch caterpillars than pollen from *Bt*-enhanced maize.

The upshot of this *tour de force* is that butterfly lovers can tuck into their breakfast cereals with a clear conscience. Agriculture is always destructive of wild creatures. However, GM maize seems to be no more so than the ordinary kind.

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Medical technology

Atom-heart father

Sep 20th 2001
From The Economist print edition

An atomic heart may be just around the corner—if you can afford it

A NUCLEAR-POWERED steam engine sounds wacky enough. That such a device might be used to pump blood in an artificial heart is wackier still. Yet Claudio Filippone, a nuclear scientist at the University of Maryland, is a serious man—and he thinks it can be done. He has just filed a patent application for an implantable pump that could run for 18 years without external power or recharging, and would, he hopes, eliminate the need for traditional heart transplants.

Strictly, the device is not a steam engine, because the working fluid is not water. However, the principle is the same. A low-boiling-point liquid is vaporised by a heat source, the vapour pushes a piston, it is then condensed and the piston is sucked back to fill the vacuum. The novel element in all this is the heat source: a cigarette-sized piece of a radioactive element called curium.

Sticking a source of radioactivity into a patient may not sound such a good idea, but curium is, as these things go, relatively safe. Its radiation is easily blocked (a piece of paper suffices), so it has little scope for causing harm. And the heat that accompanies it should provide enough power to circulate the blood as effectively as does a real heart.

Vaporising the liquid is only half of the problem. Condensing it rapidly in order to suck the piston back is the other half. But Dr Filippone's design is equal to this: it uses the blood itself as a coolant. His models show that in so acting the six litres of blood that pass through the heart every minute would be raised in temperature from 37°C to 38.4°C. That rise is small enough for the heat to dissipate quickly. In cool climates, at least, patients should not notice any change in body temperature.

Although he has only tested bits and pieces of his idea, and not yet built a full prototype, Dr Filippone is reasonably confident that the design will work. Whether it is practical depends on a different consideration. Curium, which has no existing commercial applications, costs about $180 a milligram. No doubt that would drop if industrial production began in earnest, but in the meantime each Filippone heart could need as much as $6m-worth of fuel. It is rather reminiscent of what was once said of a certain Colonel Steve Austin in a classic television series. “We can rebuild him. We have the technology.” The writers of “The Six Million-Dollar Man” might have been right all along.

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About sponsorship

Japanese internment in America

The consequences of terror

Sep 20th 2001
From The Economist print edition

After the Japanese attack on the United States in 1941, tens of thousands of Japanese-Americans were sent to internment camps

TWO-AND-A-HALF months after the bombing of Pearl Harbour, President Franklin D. Roosevelt signed the notorious Executive Order 9066. As a result, more than 110,000 Japanese, virtually all the Japanese-Americans on the mainland, were "evacuated to concentration camps" in remote parts of America's mountain states. The words were his, though they were soon replaced in official parlance by the euphemism, "reception centres".

Corbis

By Order of the President: FDR and the Internment of Japanese Americans
By Greg Robinson

Harvard University Press; 314 pages; $27.95 (October) and £19.50 (forthcoming)

Buy it at
Amazon.com
Amazon.co.uk

In practice, the Japanese lost almost all of their property and they were often brutally beaten by their guards. Roughly 30% of them were first-generation *Issei*, that is, persons of Japanese birth. Most of the *Issei* were over 50 and were barred from becoming citizens. The other 70% were second-generation *Nisei* who were American citizens by virtue of having been born in the United States. The average age of the *Nisei* was 18.

The internment of the *Issei* and *Nisei* has long been regarded as a grave breach both of American constitutional law and of human rights, and that cannot be denied, though it is interesting that the Canadian government did something similar by order in council. In America, this happened, of course, at a time of national outrage, and of real, if unrealistic, fear that Pearl Harbour was the prelude to a Japanese invasion. It can be compared to the harsh British response to the Irish Easter uprising, which coincided with the battle of the Somme.

Roosevelt's order was a response both to public panic in California, where there were jittery rumours of Japanese espionage and sabotage, and to the military's fears of fifth-column activity. There was a long history of hostility to the Japanese on the west coast, and after Pearl Harbour it escalated into almost hysterical xenophobia. The governor of California, Earl Warren, none other than the future chief justice whose Supreme Court would launch the civil-rights revolution with its decision in the Brown case, strongly supported evacuation at the time.

What Greg Robinson shows, in this careful and fair-minded study, is that Roosevelt himself, far from being the scourge of racism portrayed in New-Deal hagiography, had a long history of racial prejudice against the Japanese, which had been exacerbated by the Japanese attack on China. The American upper class in general were sympathetic to the Chinese and anti-Japanese. Roosevelt's grandfather lived in Canton (now Guangzhou) as a merchant for many years and the Roosevelts felt this particularly strongly.

As a young man, FDR had been influenced by Admiral Mahan and his school, who taught in terms richly dipped in racism and eugenic theory, that the Japanese were destined to be America's enemy and could never be assimilated. FDR twice wrote strongly anti-Japanese articles, and in the middle 1930s he was already concerned about the dangers of Japanese sabotage in Hawaii. (Ironically, only a few of the 150,000 Americans of Japanese descent in Hawaii were affected by the evacuation order.)

Mr Robinson indulges Roosevelt somewhat when he absolves him of the charge of racism, and convicts him only of a blend of weak administration and deadly indifference, which, he says, was informed by

racial hostility but not synonymous with it. Roosevelt did not simply order the evacuation of the Japanese-Americans, but also resisted the ending of the exclusion order when even his most conservative colleagues realised that it was both probably unconstitutional and absolutely unjustified. That he was keen to avoid anti-Japanese rioting in California during the 1944 election campaign makes his delay even more inexcusable.

Mr Robinson judges that this sorry story came about not only as a result of Roosevelt's personal negative views about the Japanese but also because of the character of his presidential style. In this instance, it seems, FDR's legendary ability to split authority between different agencies, and take advantage of their rivalry, was not a virtue, but a cause of irrational action. It inflicted grave injustice on a large group of people, and constituted a grave blot on his and his administration's reputation.

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About sponsorship

Cultural history

Minds of their own

Sep 20th 2001
From The Economist print edition

IT IS never easy for a cultural historian to know what people think about the books they read. You can measure the sales, you can read the reviews, you can note the responses of other authors, but none of this comes close to capturing the visceral, fleeting experience of the first-time reader. He may be bored, she may feel angry, both of them may forget the book the moment they finish it. Or it could be, as is the case with so many of the people whom Jonathan Rose writes about here, that a thrilling sense of being let in upon a whole new world, whether that of Milton, Shakespeare or Shelley, lingers for decades, shaping an entire life and mind.

The Intellectual Life of the British Working Classes
By Jonathan Rose

Yale University Press; $39.95 and £29.95

Buy it at
Amazon.com
Amazon.co.uk

Mr Rose, who as an historian of the book belongs to a growing sub-discipline, has written a masterly account of the way in which the British working classes (and that term must remain emphatically plural, since Mr Rose moves from the landlocked rural poor, to London's Jewish East End, to the clattering factory towns of north-western England) have taught, soothed and entertained themselves through their own intellectual resources. While the focus of his enquiries stays centred on reading not just the classics but newspapers, penny dreadfuls and sex manuals too, Mr Rose also takes in films, amateur dramatics and art shows—anything, in fact, to which people without formal education or money went to stretch their minds.

In a masterly introduction, Mr Rose suggests that recent developments in cultural and critical theory have obscured, or more accurately ignored, the experience of working-class audiences of books, plays and paintings. Theorists have been so keen to speculate on the way in which “Great Expectations”, Billy Bunter or the Tarzan films reproduced the dominant class and race relations of their time that they have not bothered to wonder how individual men and women received and interpreted these built-in biases.

By reading through thousands of diaries and autobiographies, the kind of archival foot-slogging which some cultural theorists are apt to avoid, Mr Rose has found persuasive evidence that, far from being passive consumers of material handed down by their masters, working-class audiences were sharp and active critics. Time and again he shows us laundresses, miners and farmhands filtering, challenging and reworking any readings of artworks which did not strike them as entirely apt.

The proof of the pudding came with Marxism, which signally failed to take off amongst the British working classes of the late 19th century. The leaders of the growing labour movement were exactly the kind of self-educated men who prided themselves on a fierce intellectual independence from ready-made doctrine. Marxism, with its emphasis on the mass, indifference to the individual, and its alienating conceptual apparatus, ran counter to everything the self-educated British people had worked for—namely, a mind of their own. When the first large batch of Labour MPs to enter parliament in 1906 were questioned as to their favourite reading, only two mentioned Marx.

It is hard to stress how important this book is. Mr Rose has swept away any lingering guesswork and approximation about the intellectual life of the British working classes in the industrial age. Instead of vague hypotheses about the transmission of culture to those who were not supposed to have it, Mr Rose returns us to the actual thoughts and feelings of the countless working men and women who insisted, often against the odds, on finding things out for themselves.

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New fiction

Saying sorry

Sep 20th 2001
From The Economist print edition

Ian McEwan's new novel, about the real and the imaginary, is his best yet

IT IS rare for a critic to feel justified in using the word “masterpiece”, but Ian McEwan's new book really deserves to be called one. We have known for a long time that he is a virtuoso technician, with almost too much facility for his own good. “Amsterdam” may have won him the Booker prize for fiction in 1998, but it was thin and irritatingly clever-clever. “Atonement”, which is also on this year's Booker shortlist, is a work of astonishing depth and humanity.

Atonement
By Ian McEwan

Jonathan Cape; £16.99
Doubleday; 372 pages; $26

Buy it at
Amazon.com
Amazon.co.uk

Mr McEwan has certainly been thinking about the pitfalls of being seduced by one's own literary powers. His new heroine, Briony, is a novelist. We first meet her at the age of 13, a dreamy child in a pre-war country house. The upper-class milieu, the sense of place and time, are rendered with an exactitude reminiscent of Elizabeth Bowen, a novelist to whom he alludes. The distinction is that Bowen was writing from experience, while Mr McEwan is relying purely on imagination.

The difference, to the novelist, between the real and the imaginary becomes Mr McEwan's major theme. Foiled in an attempt to stage a play of her own writing, Briony engineers another plot which impinges irrevocably on real lives. Her over-active mind misreads what is going on before her eyes and her evidence eventually puts her sister's lover, Robbie, in prison. After his release, Robbie finds himself in the army; the second half of the novel, brilliantly realised, follows his experiences at Dunkirk. Meanwhile, Briony, now a nurse, becomes consumed by guilt at what she has done. But she is neither able to get a court to believe her changed story nor to secure Robbie's forgiveness. In a postscript we learn that the novel we have been reading is the 70-something Briony's attempt to tell the truth and atone for her past. We are left with the tantalising question of whether we can believe her now.

To say that “Atonement” is about the nature of fiction implies a post-modern tricksiness which the book resolutely eschews. Its epigraph, from Jane Austen, assures us that we really are in the territory of the traditional novel, though this one wears its relationship to its forebears—which range from “Clarissa” to Henry James—lightly. In it, Mr McEwan has achieved the difficult task of combining literary sophistication with moral gravity. Unlike his last, this novel really is worthy of the Booker.

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New fiction

Strange but true

Sep 20th 2001
From The Economist print edition

THE hybrid literary form developed by W.G. Sebald, a German-born author who lives in England, is both ancient and modishly modern. Like a chic post-modernist, but also like a classical poet, he mixes fiction with history and meditation, endlessly digressing into new stories. He writes about how grand events echo in the lives of individuals, and of the corrosive effects of time and memory.

Austerlitz
By W.G. Sebald (translated by Anthea Bell), W.G. Sebald and translated by Anthea Bell

Random House; $25.95
Hamish Hamilton; £16.99

Buy it at
Amazon.com
Amazon.co.uk

The eponymous subject of “Austerlitz”, his fourth book, is a veteran of one of the *Kindertransport* that came to Britain just before the second world war. An unnamed narrator recalls how he met the mysterious Jacques Austerlitz in Belgium, where they talk about architecture—in particular the hubristic grandiosity of public buildings, and the extravagant but useless defensive fortifications once beloved of European rulers. These conversations announce the themes of the conversations they will have decades later, which touch on the frenzied elaborations of Nazism and describe the ultimately futile defences Austerlitz himself erected against the awareness of his lost origins.

Although it is more like a conventional novel than Mr Sebald's other works, “Austerlitz” still refuses to behave like one. As the reader is reminded, Austerlitz was Fred Astaire's real name as well as a famous Napoleonic battle, and the experiences of Austerlitz the man merge with other traumas in European history, and with the thoughts of Mr Sebald's hypersensitive narrator. The book is punctuated by odd illustrations which both announce and undercut the veracity of the story.

Like Mr Sebald's black-and-white photos, memory for Austerlitz offers some compensation for the erosions of time; yet it is also excruciating. He, and the book, are preoccupied with the possibility of time-travel that the imagination offers. Mr Sebald's style reinforces the theme of time's fluidity. He has a new translator, but his sentences remain long and melodious; they are more emotional units than grammatical or logical ones, like the book as a whole. Never a great enthusiast for paragraphs, he has now virtually abandoned them altogether.

This can make the book tricky for readers. For some, Mr Sebald's stream-of-consciousness, along with his other mannerisms, will be frustrating. But the tactful poignancy with which he treats both the mundane and the dramatic will reward those who persevere—as will the book's insight that real tragedy consists less of violence than of loss.

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On terror and the Taliban

The published word

Sep 20th 2001
From The Economist print edition

BOOKS IN BRIEF

A list of background books to the events of September 11th

IN THE days after the attacks on New York and Washington, DC, it was not only politicians and officials who realised how little they knew about the perpetrators, their motives or their putative backers. Publishers have long lead times, and some of the books mentioned in this reading list are no longer new. But with exceptions most of them should be obtainable in shops, on the web or directly through their publishers. (Name spellings are given as in book titles).

On America's prime suspect, Osama bin Laden himself, Peter Bergen's **Holy War, Inc** (Free Press) will be published in November and Elaine Landau's **Osama Bin Laden: A War against the West** (Twenty First Century Books, New York) will appear soon. Already out are **The New Jackals** by Simon Reeve (Northeastern University Press) and **Usama bin Laden's Al-Qaida** by Yonah Alexander and Michael Swetnam (Transnational, New York).

War in Afghanistan, America's help for the *mujahideen* and the rise of the Taliban are examined in M.J. Gohari's **Taliban** (Oxford University Press) and John Cooley's **Unholy Wars** (Pluto Press, London). Written by an American television reporter, it blames America for the results of what some have called the CIA's *jihad* in the 1980s. In **Taliban** by Ahmed Rashid (Yale University Press; I.B.Tauris, London), a Pakistani journalist dwells on the oil politics of central Asia. Eric Margolis's **War at the Top of the World** (Routledge) widens the area of tension to include Tibet as well as the India-Pakistan dispute over Kashmir.

The use of terror and how to defend against it are scrutinised in Paul Pillar's **Terrorism and U.S. Foreign Policy**, which came out in April from the Brookings Institution, Washington, DC. Counter-terrorism, he argues, should be a foreign-policy priority. But military force, he believes, is in the end less effective against terrorism than good intelligence and co-operation with foreign governments. Two web sites contain information on organisations designated as advocating, harbouring or using terror: the library of the **Naval Postgraduate School** (http://web.nps.navy.mil) and the **Terrorism Research Center** (www.terrorism.com). Both contain the State Department's yearly **Patterns of Global Terrorism**, a basic document for American policy (also available directly, from www.state.gov).

On Islam itself, a classic book by Edward Mortimer, **Faith and Power: The Politics of Islam** (Random House; Faber), is now hard to find but available in good libraries. Fred Halliday's recent **Nation and Religion in the Middle East** (Lynne Rienner, Colorado; Saqi Books, London) has essays on fundamentalism and the state as well as on terrorism in historical perspective.

French scholars are strong on the Middle East and the Islamic world. Of note are two books by leading specialists: **Jihad: The Rise and Fall of Islamic Extremism** by Gilles Kepel (forthcoming in translation from I.B. Tauris), and **The Failure of Political Islam** by Olivier Roy, which made an impact some years ago and can still be found in paperback from I.B. Tauris). Due out early next year from the same publisher is **Face to Face with Political Islam** by a French journalist, François Burgat, who spent much of the 1990s interviewing members of militant Islamic groups, whose politics he tries sympathetically to understand.

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The face of portraiture

Making a splash

Sep 20th 2001
From The Economist print edition

Must a portrait be a likeness?

THERE have been cubist portraits, abstracts, holograms—even squiggles. But few works, since Francis Picabia's depiction of Marie Laurencin as an imaginary machine, challenge convention as much as the portrait of Sir John Sulston by Marc Quinn, recently unveiled at the National Portrait Gallery.

The work has no nose, no mouth, not even eyes. In fact, it doesn't have a face at all. Instead, the story of Sir John's work on the international human genome project is portrayed through his gene structure. He gave some of his DNA—in a sperm sample—from which a culture of cells was grown in a jelly. Mr Quinn, with the help of the Wellcome Foundation, turned the material into a work of art. The result is yellowish blobs in a paler yellow fluid, surrounded by a highly polished steel frame. But it's not what you see that is the point; it's what you think. The work is “the most realist portrait in the gallery”, says Mr Quinn, “since it carries the actual instructions that led to the creation of John. It is a portrait of his parents, and every ancestor he ever had back to the beginning of Life in the universe.”

Whether it is a portrait is just one question that needs answering. Alongside the work is a lot of supporting documentation, including photographs of Sir John and the artist. One wonders, though, when it is divorced from this educative handrail, whether the work won't be seen as a gimmick, more a medieval relic—like the arm of St George, say—than a truly modern portrait.

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Defining masterpieces

Not in the head

Sep 20th 2001
From The Economist print edition

HANS BELTING, a German art historian, is known for his striking and original theories about the nature of art, presented with a broad historical sweep. In “Likeness and Presence” (1994), the English edition of a German work which first appeared in 1985, Mr Belting questioned the character of the carved or painted images in the Christian period of art ending around 1400. Images are best explained, in Mr Belting's view, by what we use them for and how we think of them, two things which alter with time. In the Christian period, images were largely used, not for aesthetic pleasure or admiration, but for ritual and doctrinal purposes. His book, sub-titled “A History of the Image Before the Era of Art”, was held by some—not wholly misleadingly—to propose that Christian art was not really art.

The Invisible Masterpiece
By Hans Belting

University of Chicago Press; 480 pages; $45. Reaktion Books; £27

Buy it at
Amazon.com
Amazon.co.uk

Now Mr Belting has leaped into the modern period to scrutinise our concept of a masterpiece. This latest book (published in German in 1998) spans the years from 1800 to the present—two centuries well within the recognised compass of art history and art theory. Masterpieces (and with them the modern museum) emerged in two steps, according to Mr Belting, out of the individualism of the Romantic era. First the Enlightenment's “cult of the idea” gave way to the Romantics' insistence on the value of individual experience and expression. And from that came the idea of an “absolute” work of art that was perfect and utterly unique, in short, a masterpiece.

To those for whom a wholly Christian work by Cimabue, say, is unmistakably art or for whom plenty of pre-19th century masters (such as Titian or Velazquez) undoubtedly painted masterpieces, Mr Belting has an initially soothing distinction between art as an idea and art works as objects; the works, that is, are one thing, how we think about them—Mr Belting's topic—another. On this approach, a link might even suggest itself between the faith underpinning the usage of Christian images and the modern idealisation of art.

With customary scholarship, Mr Belting invokes vivid examples. He tells us how the Louvre in Paris was opened in 1793 as a museum for the history of art but was soon transformed into something different: a repository of surviving specimens of past excellence, a home or temple for masterpieces. He shows how Raphael's Sistine Madonna gave birth to a veritable Romantic cult, and he calls on Winckelmann, Baudelaire, Stendhal, Gautier, Pater, Proust and Ruskin to voice their thoughts about truth, beauty, the ideal and the imagination. He examines the relationship of Ingres and Delacroix to past masters, recounts the row over Manet's “Olympia”, and explores the reception of Cézanne, Rodin, Gauguin, Van Gogh, Matisse and Picasso. He ends with Duchamp, Pollock, Warhol, Rauschenberg, happenings and video installations.

The material is rich and always rewarding. But Mr Belting's interpretations often fail to convince. The whole point of his approach is to bring shifting theories of art and historical writing about art to bear on our understanding of particular art works. But is this the right way round? Art is not all in the mind's eye, and the power or function of art works, be they Christian or modern, is not entirely dependent on acquaintance with the context in which they were originally conceived. In some ways, Mr Belting himself is guilty of the very idealism about art whose sources he traces with such detective skill.

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Masaccio's panels

Sep 20th 2001
From The Economist print edition

Masaccio, the first great painter of the Italian Renaissance, was a pioneer. He was the first major artist to use scientific perspective in painting, his style was far more naturalistic than that of his predecessors and his psychological depiction was rivalled only by Giotto. Which is why, when the National Gallery in London began courting museums in Italy, Germany and America to bring together all 11 known fragments of Masaccio's magnificent Pisa altarpiece, it was such an important task. Although Michelangelo studied it, the masterpiece has never been seen in one place since it was dismembered in the 16th century. Now, in time to celebrate the 600th anniversary of Masaccio's birth this year, it can be.

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Ahmad Shah Masoud

Sep 20th 2001
From The Economist print edition

Ahmad Shah Masoud, a hero of Afghanistan, died on September 15th, aged 49

EPA

Get article background

FOR writers, broadcasters and assorted adventurers seeking to understand Afghanistan, the headquarters of Ahmad Shah Masoud would often be their first call. Unlike leaders of the Taliban, whose belief in public relations was minimal and who anyway regarded westerners as inherently hostile, Mr Masoud was welcoming. He was patient with his visitors' questions, however naive, and willingly posed for photographs. He was a careful dresser: what looked like designer boots shined like a guardsman's. Now, would the visitors care to see the front line?

A writer in *Adventure*, an American magazine, repaid his host with an article that began:

> The fighters were down by the river, getting ready to cross over, and we drove out there in the late afternoon to see them off... Across the floodplain, low, grassy hills turned purple as the sun sank behind them, and those were the hills these men were going to attack. They were fighting for Ahmad Shah Masoud—genius guerrilla leader, last hope of the shattered Afghan government... We wished Masoud's men well... The stars had come out, and the only sound was of dogs baying in the distance. Then the whole front line...rumbled to life.

Whether Mr Masoud enjoyed the article it is difficult to say. He preferred the romantic writing of Victor Hugo to that of the Hemingway school. But he would have been grateful for the publicity. In the past few months Mr Masoud's forces, confined to a pocket of territory in the north-east of Afghanistan, have been short of money and arms, facing Taliban fighters convinced they could complete their conquest of the country. Mr Masoud had to show his supporters abroad that his cause was not lost. This year, he visited Russia, India and Europe to shore up his support. His speech to the European Parliament in April, at the invitation of its French president Nicole Fontaine, was a diplomatic success. Charm could be a potent weapon.

Enter the Russians

The French particularly admired Mr Masoud. He had learnt their language at a *lycée* in Kabul, in the distant days of nostalgic memory when Afghanistan was a monarchy. He liked to say that De Gaulle was one of his heroes, but as a politician rather than a soldier. Although his father was a colonel, Mr Masoud chose to study engineering. When the fighting was over, he would say, he would use his engineering skills to help rebuild the country.

The king was deposed in 1973. During the next quarter century Afghanistan became a battlefield, partly tribal, partly international. For ten years, from 1979 to 1988, the United States fought a proxy war with the Soviet Union, supplying the Afghan resistance with arms to fight the Soviet occupiers. It was at this time that Mr Masoud first became famous as a guerrilla leader. In the search for heroes in what was in fact a brutal and unglamorous campaign, he was a natural: the scholar who had put aside his studies and picked up a rifle to defend his homeland.

Some writers have credited Mr Masoud with driving the Soviet army from Afghanistan when the reality was more prosaic: the Russians withdrew because of growing civilian opposition at home, rather as the Americans were undermined in Vietnam. All the same, Mr Masoud proved to be a resourceful leader,

especially in defence. The Russians could never penetrate the redoubt he created in the Panjshir valley. The outside world liked to call him “the lion of Panjshir” although to his men he was simply *amir* (the commander) or *saab*, an Urdu word from which sahib is derived.

In recent years Mr Masoud again retreated to the Panjshir with the advance of the Taliban. Like many Afghans, he at first welcomed the Taliban. Their fierce interpretation of Islam was not to his taste: Mr Masoud had been brought up with western ideas of personal freedom. But the Taliban had brought order to the lawless territories they occupied and seemed to offer the prospect of compromise in government. That illusion disappeared in 1996 when they laid siege to Kabul, the capital. They promised to “liberate” Kabul's people from their corrupt government.

Mr Masoud was defence minister in that government, headed by Burhanuddin Rabbani, which, theoretically, is still in existence in exile. The Rabbani circle was indeed probably corrupt, and Mr Masoud was blamed for much of the destruction of Kabul and the deaths of thousands of civilians opposed to the government. Nevertheless, for many Afghans he remained a popular figure. With his troops and what materials (including 2,000 books) he could transport, Mr Masoud made a fighting retreat to the Panjshir. He was murdered, apparently, by two men posing as western cameramen. The camera that he thought would convey his message to the world blew up in his face. According to some reports, the murder was arranged by Osama bin Laden as a gift to the Taliban.

Others will seek the leadership of the Panjshir, which is said to be defended by 12,000 fighters. One candidate being mentioned is Abdul Rashid Dostam, who controlled a slice of territory until it was taken by the Taliban. But he is a former communist, knows no French, lacks charm and, in the interviews he has given, no one has remarked on his boots.

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Overview

Sep 20th 2001
From The Economist print edition

The world's central banks cut **interest rates**, in a joint effort to counter the economic turmoil caused by the terrorist attacks in America. America's Federal Reserve cut its key federal-funds rate from 3.5% to 3.0%, its lowest in almost eight years. The European Central Bank followed suit, lowering its main lending rate from 4.25% to 3.75%. Sweden and Switzerland too joined the ECB's rate-cutting move. The central banks of Canada and Britain also did their bit with one-half and one-quarter percentage-point cuts, respectively. In Japan, where rates are already near 0%, the central bank intervened in the foreign-exchange market to help strengthen the dollar and hold down the yen.

Stockmarkets were unimpressed by the co-ordinated rate cuts. The Dow Jones Industrial Average fell by 685 points on September 17th, when the New York Stock Exchange re-opened after a four-day closure. It fell further over the next two days. Germany's DAX fell by 6.8% and France's CAC-40 declined by 5.5%. Japan's market was the only rich-country stockmarket to rise, with the Nikkei chalking up a net gain of 3.4%.

In **America**, industrial output fell in August for the 11th straight month, leaving it down by 4.8% on the year. Consumer-price inflation inched up by 0.1%, after a 0.3% decline in July.

Inflation also edged up in **Britain**. Retail-price inflation excluding mortgages rose by 0.4 percentage points in August to 2.6%, climbing above the Bank of England's 2.5% inflation target.

Euro-area growth slowed to 0.1% in the second quarter. German retail sales slipped by 0.1% month-on-month in July, below expectations of a 0.3% rise.

There was new gloom in the outlook for **Japan**. Consumer confidence in August was at its most depressed ever. The consumer-sentiment index, which rises above 100 when more consumers expect a worsening economy in the coming year, went up by 16 points to 148. This is the highest level of consumer worry since the survey began in 1977.

Gold prices climbed to $289 an ounce, from $271 just before the terrorist attacks on September 11th. But **oil** prices, which spiked briefly to $30 a barrel, have fallen back below their level before the attacks.

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Output, demand and jobs

Sep 20th 2001
From The Economist print edition

% change at annual rate

	GDP		The Economist poll GDP forecasts		Industrial production	Retail sales (volume)	Unemployment % rate	
	1 qtr	1 year	2001	2002	1 year	1 year	latest	year ago
Australia	+ 3.6	+ 1.4 Q2	+ 2.5	+ 4.0	– 1.4 Q1*	+ 0.7 Q2	6.8 Aug	6.1
Austria	+ 1.6	+ 2.2 Q1	+ 1.7	+ 2.1	+ 8.0 Jun	– 3.3 May	3.9 Aug	3.6
Belgium	– 2.4	+ 1.7 Q2	+ 1.9	+ 2.4	+ 5.2 Jul*	+ 5.3 Jun	11.6 Aug*	11.9
Britain	+ 1.4	+ 2.1 Q2	+ 2.1	+ 2.6	– 3.2 Jul	+ 6.3 Aug	5.0 Jul‡	5.3
Canada	+ 0.4	+ 2.1 Q2	+ 2.1	+ 2.8	– 2.4 Jun	+ 3.5 Jun	7.2 Aug	7.1
Denmark	– 4.6	+ 1.0 Q1	+ 1.3	+ 2.1	+ 4.4 Jun	+ 3.0 Jun	5.1 Jul	5.4
France	+ 1.0	+ 2.3 Q2	+ 2.2	+ 2.3	+ 2.3 Jun	– 1.2 Jul	8.9 Jul	9.5
Germany	nil	+ 0.6 Q2	+ 1.1	+ 1.9	– 1.5 Jul	+ 0.9 Jul	9.3 Aug	9.4
Italy	– 0.5	+ 2.0 Q2	+ 1.9	+ 2.2	+ 1.7 Jul	+ 0.1 Jun	9.5 Apr	10.7
Japan	– 3.2	– 0.7 Q2	– 0.4	+ 0.5	– 8.5 Jul	– 2.4 Jun	5.0 Jul	4.7
Netherlands	+ 1.6	+ 1.5 Q2	+ 1.7	+ 2.5	+ 0.7 Jun	+ 1.8 May	2.0 Aug§	2.5
Spain	+ 1.9	+ 2.9 Q2	+ 2.7	+ 2.8	– 1.6 Jul	na	13.0 Aug	13.9
Sweden	+ 1.3	+ 1.4 Q2	+ 2.0	+ 2.6	+ 2.6 Jun	+ 2.1 Jun	4.3 Aug*	5.1
Switzerland	+ 1.7	+ 2.0 Q2	+ 1.6	+ 1.9	+ 5.1 Q1*	+ 3.3 Jul	1.7 Aug*	1.8
United States	+ 0.2	+ 1.2 Q2	+ 1.6	+ 2.6	– 4.8 Aug	+ 3.8 Jul	4.9 Aug	4.1
Euro area	+ 0.2	+ 1.7 Q2	+ 1.8	+ 2.2	+ 1.4 Jun	+ 2.1 Jun	8.3 Jul	8.8
MORE COUNTRIES	Data for the countries below are not provided in printed editions of *The Economist*							
Finland	– 0.4	+ 3.4 Q1	na	na	– 5.4 Jul	+ 2.2 May	7.8 Aug*	8.3
Greece	+ 2.8	+ 4.9 Q2	na	na	– 0.8 Mar*	+ 8.1 May	na	na
Iceland	na	+ 3.62000	na	na	+ 2.5 2000	na	1.2 Jul	1.3
Ireland	na	+12.1 Q4	na	na	– 2.3 Jul*	+ 1.1 Jun	3.7 Aug	3.9
Luxembourg	na	+ 8.52000	na	na	+ 1.4 May*†	+ 9.1 Jun	2.4 Jul	2.6
New Zealand	+ 0.9	+ 0.4 Q1	na	na	+ 0.9 Q1*	+ 7.2 Q2	5.2 Q2	6.1
Norway	+ 0.5	+ 1.4 Q2	na	na	– 8.0 Jul*	+ 0.4 Jul	3.6 Q2	3.3
Portugal	– 0.3	+ 2.2 Q1	na	na	+ 0.6 Jul*	+ 2.2 May	4.2 Q1	4.4

*Not seasonally adjusted. ‡ May-Jul; claimant count rate 3.1% in Aug. §Jun-Aug.

Text refers only to the first 16 countries listed

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Prices and wages

Sep 20th 2001
From The Economist print edition

% change at annual rate

	Consumer prices*			The Economist poll consumer prices forecast		Producer prices*			Wages/earnings		
	1 year		year ago	2001	2002	1 year		year ago	1 year		year ago
Australia	+ 6.0	Q2	+ 3.2	+ 4.0	+ 2.4	+ 5.6	Q2	+ 7.4	+ 3.7	Q2	+ 3.9
Austria	+ 2.5	Aug	+ 2.7	+ 2.5	+ 1.8	+ 1.7	Aug	+ 4.3	+ 2.8	Jul	+ 2.0
Belgium	+ 2.7	Aug	+ 2.9	+ 2.5	+ 1.9	+ 4.0	Jul	+ 8.9	+ 2.6	Q2	+ 2.2
Britain	+ 2.1	Aug	+ 3.0	+ 2.1	+ 2.3	+ 0.3	Aug	+ 2.3	+ 4.6	Jul	+ 3.9
Canada	+ 2.8	Aug	+ 2.5	+ 2.8	+ 2.1	+ 0.9	Jul	+ 4.2	+ 1.7	Jun	+ 1.0
Denmark	+ 2.5	Aug	+ 2.4	+ 2.4	+ 2.0	+ 1.5	Aug	+ 6.4	+ 4.7	Q2	+ 3.3
France	+ 1.9	Aug	+ 1.8	+ 1.8	+ 1.5	+ 2.3	Jun	+ 6.0	+ 4.3	Q1	+ 5.2
Germany	+ 2.6	Aug	+ 1.8	+ 2.6	+ 1.5	+ 1.5	Aug	+ 5.6	+ 1.8	Jun*	+ 2.1
Italy	+ 2.8	Aug	+ 2.6	+ 2.7	+ 2.0	+ 1.4	Jul	+ 6.7	+ 2.5	Jul*	+ 2.0
Japan	− 0.8	Jul	− 0.5	− 0.5	− 0.4	+ 0.1	Aug	+ 0.2	+ 1.4	Jul*	+ 1.2
Netherlands	+ 4.7	Aug	+ 2.5	+ 4.6	+ 2.5	+ 2.4	Jul	+ 8.0	+ 4.4	Jul	+ 3.2
Spain	+ 3.7	Aug	+ 3.6	+ 3.7	+ 2.8	+ 2.0	Jul	+ 5.5	+ 3.4	Q1†	na
Sweden	+ 3.1	Aug	+ 1.3	+ 2.3	+ 1.8	+ 2.1	Jul	+ 3.7	+ 2.3	Jun*	+ 4.9
Switzerland	+ 1.1	Aug	+ 1.1	+ 1.3	+ 1.2	− 0.2	Aug	+ 2.4	+ 1.3	2000	+ 0.3
United States	+ 2.7	Aug	+ 3.4	+ 3.2	+ 2.2	+ 2.1	Aug	+ 3.4	+ 4.2	Aug	+ 3.8
Euro area	+ 2.7	Aug	+ 2.7	+ 2.7	+ 1.8	+ 2.3	Jul	+ 5.6	+ 2.6	Q1	+ 2.4
MORE COUNTRIES	Data for the countries below are not provided in printed editions of *The Economist*										
Finland	+ 2.4	Aug	+ 3.8	na	na	− 0.1	Aug	− 7.6	+ 4.8	Q2*	+ 4.6
Greece	+ 3.8	Aug	+ 3.0	na	na	+ 4.5	Jul	+ 7.7	na		na
Iceland	+ 8.4	Sep	+ 4.0	na	na	+ 6.9	Aug	+ 3.5	+ 8.1	Jul	+ 7.9
Ireland	+ 4.6	Aug	+ 6.2	na	na	+ 2.6	Jul	+ 5.6	+ 8.1	Q1*	+ 6.1
Luxembourg	+ 2.8	Aug	+ 3.1	na	na	+ 0.4	Jul	+ 6.7	+ 7.8	Jun*	+ 5.3
New Zealand	+ 3.2	Q2	+ 2.0	na	na	+ 8.1	Q2	+ 5.9	+ 1.8	Q2	+ 1.7
Norway	+ 2.7	Aug	+ 3.5	na	na	− 4.3	Aug	+ 6.4	+ 4.4	Q1*	+ 4.1
Portugal	+ 4.0	Aug	+ 3.5	na	na	+ 1.3	Jul	+17.4	+ 2.4	Apr*	na

*Not seasonally adjusted. †New series.

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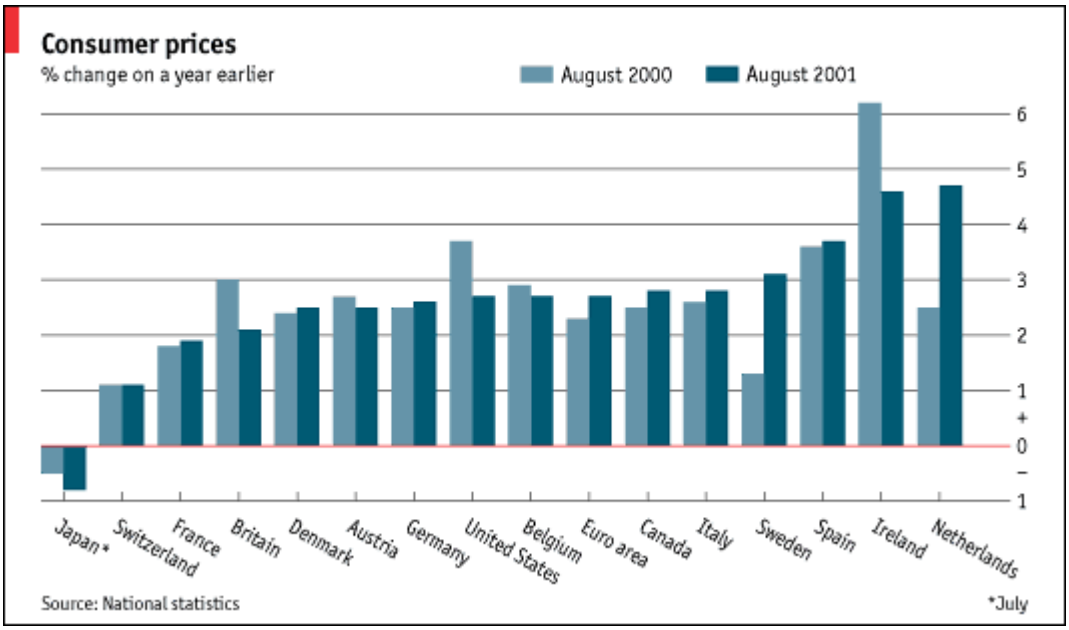
Consumer prices

Sep 20th 2001
From The Economist print edition

After rising sharply earlier this year, inflation in the rich world has fallen back to rates that are quite close to a year ago. The main exceptions are the Netherlands and Sweden, where consumer prices are now rising faster. In contrast, inflation has abated in Ireland, although it still remains relatively high. Japan, where prices are now falling even faster than a year ago, remains an outlier.



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Money and interest rates

Sep 20th 2001
From The Economist print edition

	Money supply* % change on year ago			Interest rates % p.a. (Sep 19th 2001)					
				3-mth money market		2-year	10-year gov't bonds		corporate
	narrow	broad		latest	year ago	gov't bonds	latest	year ago	bonds
Australia	+17.7	+ 6.6	Jul	4.38	6.59	4.25	5.56	6.21	7.03
Britain	+ 7.1	+ 7.6	Jul	4.56	6.13	4.59	4.88	5.35	6.47
Canada	+ 6.9	+ 4.8	Jul	3.18	5.59	3.38	5.23	5.79	6.97
Denmark	+ 5.5	+ 1.0	Jul	4.13	6.50	4.10	5.05	5.66	7.04
Japan	+ 9.7	+ 3.4	Aug	0.01	0.31	0.04	1.37	1.86	1.43
Sweden	+ 6.5	+ 2.2	Jul	3.73	3.93	3.95	5.14	5.19	5.15
Switzerland	+ 0.1	+ 2.6	Aug	2.75	3.46	3.64	3.20	3.82	4.09
United States	+ 4.0	+10.9	Aug	2.76	6.47	2.81	4.69	5.89	6.75
Euro area†	+ 3.3	+ 6.4	Jul	3.76	4.95	3.57	4.76	5.25	5.72

*Narrow: M1 except Britain and Sweden M0, broad: M2 or M3 except Britain M4. †Germany for bonds. Benchmarks: US 30-year 5.54%, Japan No.234 1.41%. Central bank rates: US fed funds 3.00%, ECB refinancing 3.75%, BOJ overnight call 0.002%, BOE repo 4.75%. Sources: Commerzbank, Danske Bank, J.P. Morgan Chase, Royal Bank of Canada, OM Fixed Income Exchange, Warburg Dillon Read, DRI-WEFA, Westpac, Thomson Financial Datastream. Rates cannot be construed as banks' offers.

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The Economist commodity price index

Sep 20th 2001
From The Economist print edition

1995=100

	Sep 11th	Sep 18th*	% change on one month	% change on one year
Dollar index				
All items	66.7	66.7	– 2.4	– 7.9
Food	67.8	68.5	– 1.4	– 0.2
Industrials				
All	65.1	64.2	– 3.8	–17.2
Nfa†	65.6	63.1	– 5.5	– 8.9
Metals	64.7	65.2	– 2.4	–22.9
Sterling index				
All items	71.6	72.0	– 3.3	–11.4
Euro index				
All items	96.6	95.2	– 3.4	–14.8
Yen index				
All items	84.2	83.3	– 4.3	+ 1.0
Gold				
$ per oz	288.45	287.50	+ 4.0	+ 5.9
West Texas Intermediate				
$ per barrel	27.63	27.74	– 1.6	–25.1

* Provisional. † Non-food agriculturals.

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Stockmarkets

Sep 20th 2001
From The Economist print edition

Market indices

	Sep 19th	2001 high	2001 low	% change on one week	% change on record high	% change on Dec 31st 2000 in local currency	% change on Dec 31st 2000 in $ terms
Australia (All Ordinaries)	2,974.1	3,425.2	2,895.4	- 2.5	-13.2	- 5.7	-16.2
Austria (ATX)	1,114.4	1,245.8	1,052.2	- 3.5	-35.8	+ 3.8	+ 2.8
Belgium (Bel 20)	2,483.4	3,030.4	2,483.4	- 4.4	-32.6	-17.9	-18.7
Britain (FTSE 100)	4,721.7	6,334.5	4,721.7	- 3.3	-31.9	-24.1	-25.4
Canada (Toronto Composite)	6,696.3	9,348.4	6,696.3	- 5.0	-41.2	-25.0	-28.2
Denmark (KBX)	213.0	294.3	210.7	- 4.7	-29.4	-19.5	-20.1
France (SBF 250)	2,495.2	3,820.2	2,495.2	- 5.7	-43.2	-33.8	-34.5
(CAC 40)	3,888.9	5,998.5	3,888.9	- 5.5	-43.8	-34.4	-35.0
Germany (Xetra DAX)	4,041.8	6,795.1	4,041.8	- 6.8	-49.9	-37.2	-37.8
Italy (BCI)	1,211.1	1,948.4	1,202.8	- 6.7	-44.5	-36.8	-37.4
Japan (Nikkei 225)	9,939.6	14,529.4	9,504.4	+ 3.4	-74.5	-27.9	-29.8
(Topix)	1,038.1	1,441.0	863.4	+ 4.8	-64.0	-19.1	-21.3
Netherlands (AEX)	432.4	642.3	426.5	- 4.5	-38.4	-32.2	-32.9
Spain (Madrid SE)	689.5	963.9	686.1	- 4.0	-39.8	-21.7	-22.5
Sweden (Affarsvarlden Gen)	185.4	293.1	184.9	- 4.2	-53.7	-33.3	-39.8
Switzerland (Swiss Market)	5,652.1	8,135.4	5,628.3	- 3.2	-32.8	-30.5	-29.2
United States (DJIA)	8,759.1	11,337.9	8759.1	- 8.8	-25.3	-18.8	-18.8
(S&P 500)	1,015.3	1,373.7	1015.1	- 7.1	-33.5	-23.1	-23.1
(Nasdaq Comp)	1,527.7	2,859.2	1527.7	- 9.9	-69.7	-38.2	-38.2
Europe (FTSE Eurotop 300)*	1,113.0	1,545.5	1,078.1	- 1.2	-34.7	-27.4	-28.1
Euro area (FTSE Ebloc 100)*	908.5	1,404.1	913.1	- 5.6	-41.4	-34.7	-35.4
World (MSCI)†	907.6	1,249.2	921.0	- 4.4	-37.4	na	-25.7
World bond market (Salomon)‡	456.5**	451.0	420.6	+ 1.8	- 0.7	na	+ 2.8

*In euro terms. †Morgan Stanley Capital International index includes individual markets listed above plus eight others, in dollar terms. ‡Salomon Smith Barney World Government Bond Index, total return, in dollar terms. ** September 18th.

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Trade, exchange rates and budgets

Sep 20th 2001
From The Economist print edition

	Trade balance*, $bn latest 12 months		Current account $bn latest 12 mths		The Economist poll % of GDP, forecast 2001	2002	Exchange rate trade-weighted† Sep 19th	year ago	Currency units per $ Sep 19th	year ago	per £	per euro	per ¥100	Budget balance % of GDP 2001‡
Australia	+ 0.7	Jul	− 9.9	Q2	− 2.8	− 3.1	67.6	73.4	2.02	1.85	2.97	1.88	1.73	0.1
Austria	− 5.4	May	− 4.7	Jul	− 2.4	− 2.3	100.5	98.7	14.8	16.2	21.7	13.8	12.6	-0.6
Belgium	+ 10.6	Jul	+ 11.2	Mar	+ 4.2	+ 4.5	99.5	97.2	43.4	47.6	63.7	40.3	37.0	0.7
Britain	− 44.9	Jun	− 19.2	Q1	− 1.7	− 2.1	104.7	106.7	0.68	0.71	–	0.63	0.58	1.2
Canada	+ 47.4	Jul	+ 25.5	Q2	+ 3.1	+ 2.3	76.2	80.8	1.57	1.48	2.30	1.46	1.34	2.6
Denmark	+ 6.8	Jul	+ 4.6	Jul	+ 1.4	+ 1.4	103.2	98.8	8.01	8.81	11.8	7.44	6.83	2.9
France	+ 0.2	Jul	+ 17.4	Jul	+ 1.5	+ 1.6	102.2	99.6	7.06	7.74	10.4	6.56	6.02	-0.5
Germany	+ 59.2	Jul	− 21.3	Jul	− 1.0	− 0.9	99.2	95.9	2.10	2.31	3.09	1.96	1.79	-1.7
Italy	+ 3.6	Jun	− 4.9	May	− 0.3	− 0.2	72.9	71.1	2,083	2,285	3,057	1,936	1,776	-1.3
Japan	+ 84.3	Jul	+ 92.5	Jul	+ 2.1	+ 2.0	141.8	160.5	117	107	172	109	–	-6.3
Netherlands	+ 18.9	Jun	+ 13.7	Q2	+ 3.9	+ 3.9	98.5	95.8	2.37	2.60	3.48	2.20	2.02	1.3
Spain	− 38.9	Jun	− 16.6	Jun	− 2.8	− 2.3	74.6	72.9	179	196	263	166	153	nil
Sweden	+ 11.8	Jul	+ 5.2	Jul	+ 2.1	+ 2.3	72.3	81.8	10.46	9.86	15.4	9.72	8.92	3.6
Switzerland	+ 0.3	Jul	+ 28.3	Q1	+10.9	+10.7	112.2	106.6	1.59	1.78	2.34	1.48	1.36	na
United States	−450.6	Jul	−449.9	Q2	− 4.1	− 4.0	115.6	114.8	–	–	1.47	0.93	0.85	2.1
Euro area	+ 2.5	Jun	− 28.0	Jun	− 0.2	− 0.1	80.1	74.9	1.08	1.18	1.58	–	0.92	-0.6
MORE COUNTRIES	Data for the countries below are not provided in printed editions of *The Economist*													
Finland	+ 13.8	Jul	+ 9.1	Jul	na	na	79.3	75.4	6.69	7.02	9.82	6.22	5.70	5.3
Greece	− 7.5	Jan	− 7.7	Jan	na	na	57.7	56.7	384	400	563	357	327	nil
Iceland	− 0.3	Jul	− 0.9	Q1	na	na	na	na	100	85.0	146	92.7	85.0	2.4
Ireland	+ 29.1	Jun	− 1.3	Q1	na	na	88.4	84.6	0.89	0.93	1.31	0.83	0.76	4.5
Luxembourg	− 2.9	Jun	+ 1.2	Q1	na	na	99.5	97.2	45.4	47.6	66.6	42.2	38.7	3.6
New Zealand	nil	Jul	− 2.3	Q1	na	na	77.2	74.8	2.31	2.45	3.39	2.15	1.97	1.0
Norway	+ 27.6	Aug	+ 26.1	Jun	na	na	98.0	92.5	8.94	9.41	13.1	8.31	7.62	15.3
Portugal	− 13.6	Jun	− 9.2	Jun	na	na	89.8	87.9	226	237	331	210	192	-1.2

*Merchandise. Australia, Britain, France, Canada, Japan and United States imports fob, exports fob. All others cif/fob. †1990=100, Bank of England. ‡OECD estimate.

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About sponsorship

Top companies by market capitalisation

Sep 20th 2001
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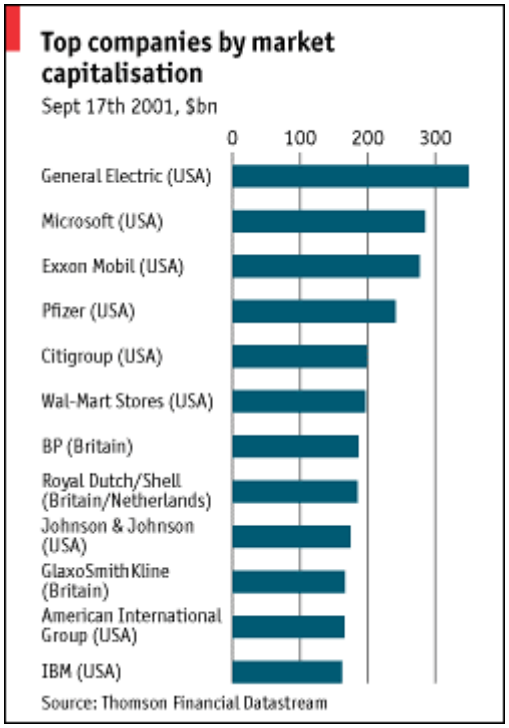

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Overview

Sep 20th 2001
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Several **Asian stockmarkets** continued to slump as America prepared the next stage of its war on terrorism. **India's** stockmarket fell by 7.5%, after its 6.1% fall last week, as fears of military action against Afghanistan increased. The Mumbai exchange is down by 29.4% since the start of the year. **Turkey's** stockmarket plunged by 15.0%, despite a 2% rise on September 19th.

Foreign direct investment in **China** fell by 40% in August from the average monthly rate from January to July. As China prepares for its entry into the WTO, foreign direct investment is expected to rise as the government opens more industries to foreigners.

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Inward FDI index

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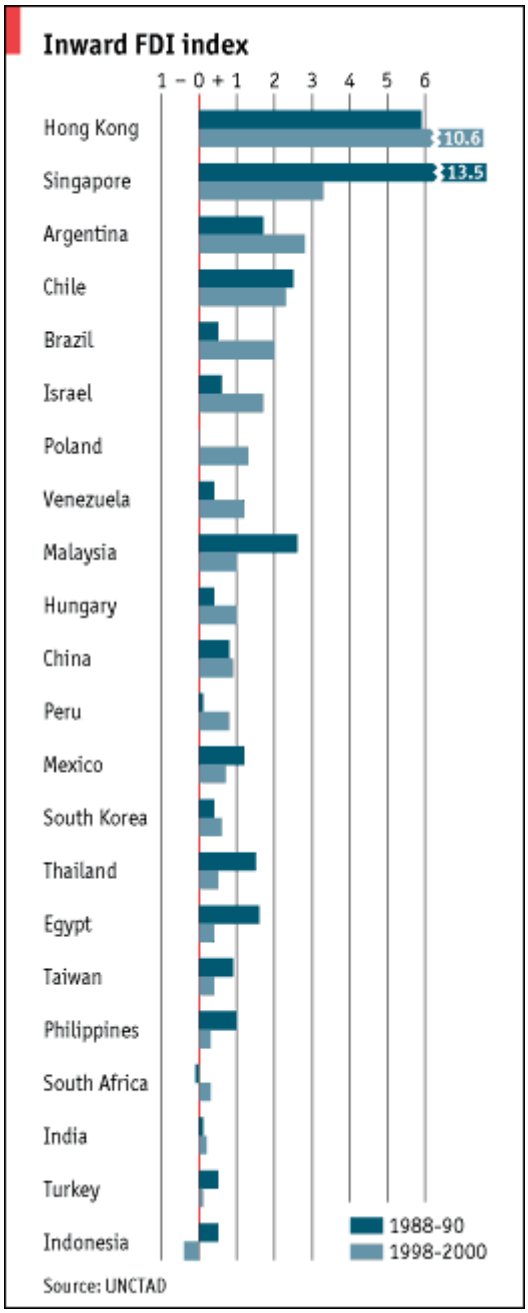
The United Nations Conference on Trade and Development's newly created inward FDI index measures foreign direct investment relative to a country's share of global GDP, employment and exports. Index values greater than one show countries that are especially appealing to foreign investors.



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Economy

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	% change on year earlier						Latest 12 months, $bn				Foreign reserves* $bn, latest	
	GDP		Industrial production		Consumer prices		Trade balance		Current account			
China	+ 7.8	Q2	+ 8.1	Aug	+ 1.0	Aug	+18.8	Aug	+20.5	2000	183.9	Jun
Hong Kong	+ 0.5	Q2	– 0.1	Q1	– 0.9	Jul	–12.1	Jul	+ 8.8	Q1	113.7	Aug
India	+ 3.8	Q1	+ 2.6	Jul	+ 4.0	Jul	– 5.5	Jul	– 2.3	Q1	42.5	Aug
Indonesia	+ 3.5	Q2	+ 7.5	Q1	+12.2	Aug	+24.5	Jul	+ 6.3	Q1	28.2	Jul
Malaysia	+ 0.5	Q2	– 5.9	Jul	+ 1.3	Aug	+15.4	Jul	+ 7.4	Q1	26.9	Jul
Philippines	+ 3.3	Q2	+11.2	Jun	+ 6.3	Aug	+ 4.5	Jul	+ 7.8	May	12.6	Jun
Singapore	– 0.9	Q2	–13.2	Jul	+ 1.3	Jul	+ 4.2	Aug	+22.6	Q2	74.4	Jun
South Korea	+ 2.7	Q2	– 5.9	Jul	+ 4.7	Aug	+13.1	Aug	+13.3	Jul	97.0	Jul
Taiwan	– 2.4	Q2	–10.4	Jul	+ 0.4	Aug	+13.8	Aug	+14.1	Q2	110.1	Jul
Thailand	+ 1.9	Q2	+ 2.1	Jul	+ 1.4	Aug	+ 2.5	Jul	+ 6.1	Jul	31.2	Jul
Argentina	– 2.1	Q1	– 5.3	Aug	– 1.2	Aug	+ 2.6	Jul	– 9.0	Q1	16.7	Jul
Brazil	+ 0.8	Q2	+ 0.8	Jul	+ 7.3	Aug	– 1.1	Aug	–27.5	Jul	35.5	Jul
Chile	+ 3.4	Q2	+ 0.3	Jul	+ 3.8	Aug	+ 1.5	Jul	– 1.6	Q2	14.5	Jul
Colombia	+ 1.6	Q2	+ 0.5	Jul	+ 8.0	Aug	+ 1.3	Jun	– 0.7	Q1	9.5	Jul
Mexico	nil	Q2	– 3.3	Jul	+ 5.9	Aug	– 9.6	Jul	–17.5	Q2	40.8	Jul
Peru	– 0.8	Jul	– 3.3	Jul	+ 1.4	Aug	– 0.2	Jul	– 1.4	Q2	8.4	Jun
Venezuela	+ 2.9	Q2	na		+12.9	Aug	+15.6	Q2‡	+11.1	Q2	10.6	Jul
Egypt	+ 6.5	2000†	+ 9.4	2000†	+ 2.2	Jun	– 9.9	Q1	– 0.2	Q1	12.9	May
Israel	+ 1.4	Q2	–10.4	Jun	+ 1.7	Aug	– 7.3	Aug	– 1.1	Q1	24.2	Aug
South Africa	+ 2.5	Q2	+ 1.0	Jul	+ 4.6	Aug	+ 4.5	Jul	+ 0.1	Q1	6.1	Jun
Turkey	– 9.3	Q2	–11.2	Jul	+57.5	Aug	–20.9	Jun	– 3.7	Jun	17.2	Jul
Czech Republic	+ 3.9	Q2	+ 9.3	Jul	+ 5.5	Aug	– 3.5	Jul	– 2.7	Q2	13.4	Aug
Hungary	+ 4.0	Q2	– 0.8	Jul	+ 8.7	Aug	– 2.2	Jul	– 1.5	Jul	12.0	Aug
Poland	+ 2.3	Q1	+ 1.1	Jul	+ 5.1	Aug	– 9.9	Jul	– 6.8	Jul	27.0	Jul
Russia	+ 4.9	Q1	+ 2.9	Jul	+20.9	Aug	+58.4	Jul	+45.9	Q1	33.7	Aug
MORE COUNTRIES	Data for the countries below are not provided in printed editions of *The Economist*											
Pakistan	+ 3.3	2001†	+ 9.1	May	+ 2.5	Jul	– 1.5	Jul	– 1.1	2001†	1.3	May
Saudi Arabia	+ 4.5	2000§	na		+ 4.6	Aug	+50.9	2000	+15.6	2000	17.0	Jul

*Excluding gold, except Singapore; IMF definition. †Year ending June. ‡New series § Economist Intelligence Unit estimate.

Text refers only to the first 25 countries listed

Sources: National statistics offices, central banks and stock exchanges; Thomson Financial Datastream; Economist Intelligence Unit; Reuters; Warburg Dillon Read; J.P Morgan Chase; Hong Kong Monetary Authority; Centre for Monitoring Indian Economy; FIEL; EFG-Hermes; Bank Leumi Le-Israel; Standard Bank Group; Garanti Bank; Deutsche Bank; Russian Economic Trends.

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Financial markets

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	Currency units			Interest rates	Stockmarkets	% change on		
	per $		per £	short-term	Sep 19th		Dec 31st 2000	
	Sep 19th	year ago	Sep 19th	% p.a.		one week	in local currency	in $ terms
China	8.28	8.28	12.1	na	1,905.6	-1.5	-13.1	-13.1
Hong Kong	7.80	7.80	11.4	2.77	9,558.2	+0.7	-36.7	-36.7
India	48.0	45.6	70.5	7.00	2,804.2	-7.5	-29.4	-31.4
Indonesia	9,605	8,800	14,098	17.89	422.5	-1.7	+1.5	+2.2
Malaysia	3.80	3.80	5.58	3.30	633.5	-8.3	-6.8	-6.8
Philippines	51.4	45.7	75.4	12.69	1,187.1	-4.4	-20.6	-22.7
Singapore	1.74	1.74	2.56	2.06	1,342.2	-7.5	-30.3	-30.6
South Korea	1,297	1,110	1,903	4.54	486.8	+2.3	-3.5	-5.9
Taiwan	34.6	31.1	50.7	3.55	3,781.2	-9.5	-20.3	-23.7
Thailand	44.2	41.7	64.8	3.00	287.1	-13.1	+6.7	+4.8
Argentina	1.00	1.00	1.47	15.80	268.6	-1.4	-35.6	-35.7
Brazil	2.71	1.83	3.97	19.06	10,554.1	-5.0	-32.3	-51.3
Chile	691	566	1,014	0.43*	5,394.0	-2.1	+10.8	-8.0
Colombia	2,343	2,210	3,438	12.05	954.1	-2.8	na	na
Mexico	9.40	9.28	13.8	9.09	5,297.9	-4.2	-6.3	-4.2
Peru	3.49	3.47	5.1	6.40	1,264.9	-0.8	+4.7	+5.7
Venezuela	743	690	1,091	13.63	7,050.0	-2.7	+3.8	-2.3
Egypt	4.26	3.52	6.25	8.81	6,207.3	-0.3	-19.0	-25.9
Israel	4.32	4.04	6.34	4.47	367.8	-2.3	-25.6	-30.4
South Africa	8.64	7.12	12.7	9.53	7,873.7	-2.9	-5.4	-17.2
Turkey	1,504,000	665,820	2,207,571	57.00	7,899.4	-15.0	-16.3	-62.7
Czech Republic	37.0	41.1	54.2	5.34	330.9	+0.1	-30.8	-29.6
Hungary	278	303	408	11.00	5,927.6	+3.1	-24.5	-23.4
Poland	4.20	4.49	6.16	14.49	12,256.1	-2.3	-31.3	-32.4
Russia	29.5	27.8	43.2	25.00	199.2	+2.1	+42.9	+39.0
EMF (MSCI)‡	1.00	1.00	1.47	na	259.7	-6.6	na	-22.2
EMBI+§	1.00	1.00	1.47	na	204.6	-2.0	na	+1.3

*Inflation adjusted. †In $ terms. ‡Emerging Markets Free. §J.P. Morgan Chase's Emerging Markets Bond Index Plus.
Sources: National statistics offices, central banks and stock exchanges; Thomson Financial Datastream; Economist Intelligence Unit; Reuters; Warburg Dillon Read; J.P Morgan Chase; Hong Kong Monetary Authority; Centre for Monitoring Indian Economy; FIEL; EFG-Hermes; Bank Leumi Le-Israel; Standard Bank Group; Garanti Bank; Deutsche Bank; Russian Economic Trends.

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